The OIL WEEKLY

"... HEROISM ABOVE AND BEYOND THE CALL OF DUTY"

Merchant Marine Distinguished Service Medal—
U. S. Maritime Commission

Below: Ribbon which may be worn
in lieu of the Medal

... Merchant Marine Distinguished Service Medal ... for heroism above and beyond the call of duty during enemy attack when (this Quartermaster) released and launched a life-raft from a sinking and burning ship and maneuvered it through a pool of burning oil to clear water by swimmning under water, coming up only to breathe. Although he had incurred severe burns about the face and arms ... guided four of his shipmates to the raft, swam to and rescued two others. His extraordinary courage and disregard of his own safety ... will be an enduring inspiration to seamen of the United States Merchant Marine everywhere."

On April 11, 1942, the Congress of the United States approved a Joint Resolution "... that the United States Maritime Commission is hereby authorized and directed, under such rules and regulations as it may prescribe, to provide and award a medal ... to each person who, in the American Merchant Marine, on or after September 3, 1939, has distinguished himself ... by outstanding conduct or service in the line of duty ..."

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LOOKING AHEAD
. . . with the Editor

VIOLENT and destructive explosions in compressed-air systems are numerous, constituting a high percentage of industrial accidents. The more destructive usually get wide publicity and lead to remedial steps at once. Less destructive accidents of this type however, are left in the background, so that there is a general lack of knowledge regarding the hazards involved as well as the lack of regulations requiring proper operation, maintenance and inspection of compressed-air plants.

An article, "Minimizing Explosions in Compressed-Air Systems," will appear in an early issue of THE OIL WEEKLY. Pointing out the dangers particularly as regards accumulation and ignition of combustible mixtures, this discussion recommends certain procedures which, if followed, will minimize the possibility of explosions in these systems.

☆

The Oil Man's Calendar

10–15	National Fire Protective Association, Palmer House, Chicago, Illinois.
20–21	A.P.I. Mid-Continent Section, Production Division, Tulsa.
24–25	Joint Production and Chemical Committee Conference, Sponsored by Technical Section of American Gas Association, Hotel Pennsylvania, New York.

THE OIL WEEKLY

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Contents • May 10, 1943

Volume 109, No. 10

The Changing Panorama.....9

Technical and Feature Articles:

Manpower Looms as Oil's Most Critical Problem.....11
By A. R. McTEE

Electric Pilot Promises Better Oil Recoveries.....13
By FRANK BRIGGS

Development and Control of Oil Reservoirs (Part 2)....21
By S. E. BUCKLEY AND R. C. CRAZE

Dual Completions Are a Sound Production Practice.....33
By E. O. BENNETT

Portable Crude Oil Heater Efficient and Economical....36

Practical Operating Hints for the Drilling Rig.....38

News and Departments:

Looking Ahead with the Editor..... 7

Washington Roundup 43

Markets, Statistics and Prices.....61

U. S. Field Operations.....67

United States Well Completions.....73

United States Wildcat Starts.....76

Squeaks from the Bullwheel.....77

Notes for the Equipment Buyer and User.....78

Men in the Industry's News.....80

Index to Advertisers.....80

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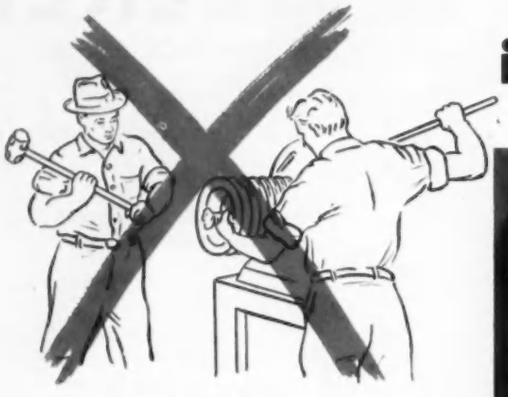

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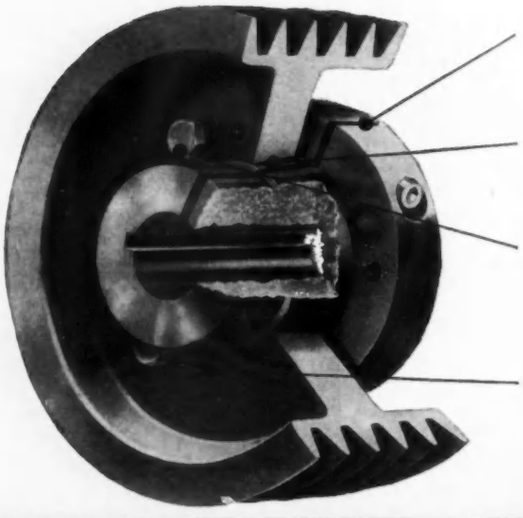

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The Changing Panorama

New Shipping Routes Demand Adjustments In Crude Prices

EARLY adjustments of crude prices are inevitable, in the opinion of men of the industry familiar with the radical changes that have occurred in the movement from wells to refineries. These changes have set up abnormal relationships and economic inequalities among the different producing districts, which cannot be corrected except through price readjustments.

Gulf Coast and Southwest Texas oils are priced high in relation to East Texas and other interior crudes under present ceilings, because they formerly had the advantage of being available for delivery in the East Coast by tanker. But those oils now are going overland to the East at transportation costs higher than involved for East Texas and Mid-Continent crudes, as the latter under rearranged wartime shipping routes are closer to the Atlantic Seaboard. Thus refiners in the Middle West and East are paying a bonus, plus greater transportation charges, for oil farthest removed. This is in direct contrast with normal price schedules, and adjustments are sorely needed.

Calculations on the differential in price on the million barrels of Gulf Coast Grade B crude that is going into Longview, for pipe-line movement to the East, indicate that the East Texas field certainly is in line for a better price.

It would be criminal to suggest that Gulf Coast and Southwest Texas crudes be lowered to equalize values. Therefore, there is no alternative, apparently, but to increase crude postings of the Inland Texas and Mid-Continent fields.

A somewhat similar uneconomic situation was created last year and eventually had to be corrected in connection with buying supplies for East Coast marketing. Eastern suppliers finally were compensated for extra transportation costs over and above normal Gulf Coast-East Coast tanker charges. Thereupon, it became advantageous to go all the way to the Southwest for fuel oil or crude, available at attractive prices, instead of buying the relatively high priced oils of the Middle West, which were nevertheless closer at hand, and purchases from the latter area lagged. Finally, Eastern refiners and marketers were granted compensation for the extra costs of the Middle Western oils, in order to draw forth maximum purchasing in the Middle West and the attendant savings in tank cars. Pending the adjustment, efficient functioning of the industry was seriously hampered, with Eastern marketers penalized in doing what needed to be done.

The inequalities now involved for producers of East Texas and the Mid-Continent similarly represent serious interference with the efficient functioning of the industry. This maladjustment is particularly deplorable in view of the urgent need for increased production in the fields nearer to the East Coast. Producing ability is alarmingly diminishing in the interior of the country, and every possible stimulus to larger production is needed. Yet price ceilings, ironically, have the effect of depriving those inland areas of geographical advantage that they have gained under the new, overland movement of oils to the east—an advantage which would be reflected in price differentials under normal functioning of economic forces.

Invitation to Scandal

THE crackpot suggestion of OPA Chief Brown in denying an increase in the price of crude oil, that the government step out and pay for wildcatting is about on a par with what you would expect from a discredited New Deal politician. Actually such action would be an invitation to a scandal, a scandal for which the oil industry would get the blame, and the public get little else than nausea. Such a plan would get a lot of wells drilled—at government expense—but they would be as political as some of the wells which Argentina drilled a few years ago to satisfy the political demands of certain areas.

Private industry (and the oil industry in particular) is showing splendid ability in getting jobs done in the face of the greatest difficulties. The public is daily coming more to the idea that some of our political hierarchy in Washington are responsible for much of the slowdown from which the war effort suffers. In the average crowd mention the name of Brown, McNutt and Wallace and you get only a contemptuous grunt.

Any Aviation Fuel Shortage Is War Department Error

UNDERSECRETARY of War Robert P. Patterson's attempt to find a "goat" for the present shortage of aviation gasoline is likely to bounce back into the lap of his own department, because it is impossible for the oil industry or other government agencies to proceed on a program without being informed as to the probable needs of the Army and Navy. Last week WPB Director Donald M. Nelson and Petroleum Administrator Harold L. Ickes told the Truman committee (Page 45, THE OIL WEEKLY, May 3) that the Army and Navy have never been sure of their plane-fuel requirements, have always been low on their estimates, and very tardy and reluctant to furnish them. Consequently, these agencies and the industry have had to do their best with unknown factors.

Currently more aviation gasoline is being delivered than military groups have asked for. Credit for this is due entirely to the foresight and ability of PAW and the industry. It will be recalled that as far back as July, 1940, that the National Defense Advisory Commission recommended creation of a 7,500,000-barrel storage of aviation fuel, but that the suggestion was not carried out because of controversy among military leaders.

It is true that the synthetic-rubber program has interferred with the construction of aviation-gasoline plants recently. But Rubber Director William M. Jeffers was given a definite assignment, and he has delivered on it. Rubber was one of the most critical problems, so there should be no criticism of a man who has been given the ball at a crucial moment and then proceeded to carry it across the goal line. Actually, the rubber program would not have interrupted aviation-gasoline facility construction, at least as greatly as it did, if a definite program had been planned as in the case of rubber. What happened was that WPB, confronted with a definite rubber program and an indefinite aviation-gasoline program, favored the giving of materials to rubber plants. This would not have occurred if the Army and Navy had given WPB estimates of its fuel requirements ear-

lier. Aviation gasoline was a problem long before rubber became critical, as the United States had launched a large plane-building program long before Pearl Harbor and was furnishing most of the 100-octane gasoline to the Allied Nations. If the Army and Navy, as urged by PAW's predecessor OPC and the industry, had made known its probable requirements at that early date an aviation-gasoline-construction program could have been well along towards completion before the rubber program was drawn up in the fall of 1942.

Oil Has Many Horses to Feed

AT THE the end of 1943 the total horsepower of the engines required for the airplanes produced annually in the United States, exclusive of spare and replacement engines, probably will be about 350,000,000, according to Harold V. Coes, president of the American Society of Mechanical Engineers.

That is a figure like the astronomer's unit of measurement—the light year; unless it is related to something one can compare it with, the mind does not take in its significance. This 350,000,000-plane-engine horsepower is probably from 1½ to 2 times the installed central station capacity of the world, and perhaps six or seven times the combined horsepower of the British and United States navies.

To feed this many horses is going to require a lot of hay and oats—aviation gasoline and lubricants.

Meanwhile, merchant ships are being built at a rate five times the 1941 output; naval ships, 2¾ times the 1941 rate; and tanks at a gigantic rate. All require petroleum-eating engines of many horsepower.

Tankers Now Carry Other Cargoes Too

TANKERS even in the past have been choice targets of Axis submarines, and because of an innovation through which they will serve the additional important purpose of transporting on their decks combat planes and torpedo boats, tankers henceforth will be doubly sought out by the under-sea raiders. However, this does not mean that higher rates of tanker sinkings will occur. On the contrary, increasingly effective anti-submarine warfare promises to alleviate the hazards to tankers as well as to other ships of the United Nations; and because of the doubly great importance of plane- and boat-carrying tankers, it is to be expected that protection afforded them will be increased.

That American tankers now are being equipped to carry on their decks planes and boats may be one reason for the predominance of tankers among merchant ships henceforth to be built. (The Maritime Commission on April 21 announced contracts for construction by the end of 1944 of 469 merchant ships, including 206 high speed tankers.)

The Truman committee of the Senate was authority for the information that through ingenious use of steel supports welded to the decks, tankers now are carrying large quantities of combat planes and torpedo boats which formerly took up space below decks on dry cargo ships.

"The enemy now knows, and it can be told," the report stated, "that through the ingenious use of steel supports welded to the decks of the tankers it is possible to transport abroad hundreds of torpedo boats and combat planes which could not carry sufficient gasoline to cross the ocean alone."

Although the committee conceded that 1942 brought more sinking than construction of Allied shipping, it declared that losses were tapering off and that the submarine menace could and would be met. The answer is stepped-up production of new merchant and escort vessels and combined use of destroyers and destroyer escorts, escort airplane carriers, land-based airplanes equipped for anti-submarine work, and sub chasers. These facilities would have greatly held down sinkings in the past, and they are being provided now to cut down losses. The committee mentioned the helicopter as a possible valuable anti-submarine device for convoy service, if it could be enlarged to carry heavy depth charges and be improved to permit deck landings.

Chance to Simplify Government Reports

UNDOUBTEDLY government has to have much information from industry in order to conduct many functions under wartime conditions. No one will object to giving of essential facts. However, when the cost of making up such reports and filling in of questionnaires runs as high as 8 percent of a company's net profit (THE OIL WEEKLY, March 8) in a single year, there can be no doubt that the system of questionnaires is too top-heavy and burdensome. Revision is certainly in order.

Therefore, it is important that the Advisory Committee on Government Questionnaires has asked for constructive suggestions that will eliminate or modify burdensome reports required by government from industry. It asks for suggestions on specific questionnaires that can be improved and simplified, or how two or more questionnaires can be combined to eliminate duplication, or what questionnaires probably could be eliminated.

Industry can speed up its own relief by taking advantage of this invitation for criticism. No views on the subject are too small not to be reported.

Building of a pipe line in the wilds of the Northwest Territory, which will connect the Ft. Norman oil fields with the Alcan Highway, requires construction over mountains, rivers, streams and other difficult desolate country. First phase was to ship miles of pipe, tractors, trucks and other equipment into the area. From the end rail it was necessary to depend upon barges for transportation of all equipment and supplies. Due to dangerous rapids on the river, it was necessary to provide a 16-mile overland passage around them. Even the 65-ton barges were transported around the rapids, as shown in this picture, released for publication by the United States Army.

Manpower Looms As Oil's Most Critical Problem

Shortage, especially of experienced technicians, may become sufficiently serious to hinder petroleum output to point it will retard military operations. Industry must immediately commence educational campaign stressing its importance to war effort and also an extensive employee training program.

By A. R. McTEE, Staff Writer

THAT oil is a top ranking battle front in this war no one will deny, for it is too important to all military and manufacturing efforts. Thus there can be no let-up in any of the activities necessary to produce, refine and transport oil. In fact there must be enlarged activities in the future, for military consumption of petroleum is due to grow enormously in coming months. Military needs have to come first; civilians bear the direct responsibility of seeing that no shortages of vital petroleum products occur. With the industry already suffering from manpower shortage, and also facing growing demands at the same time the Army and Navy are still expanding, the question of adequate manpower looms serious on the petroleum horizon. The problem is at the top of the list of things that have to be solved as thoroughly and as quickly as is humanly possible, if rising oil demands are to be met. That the industry has apparently failed to sell itself on the importance of keeping as many of its specially trained personnel as possible on the job is regrettable, and this has resulted in losses which cannot be fully repaired now. However, the industry must carry on with infinitely increased responsibility, and to do this will require manpower. Despite past mistakes, the solution of its manpower problem is largely up to the oil industry itself, and it must act before it is too late.

At the recent meeting of the Southwestern District of API, in Houston, one entire session was given over to discussions of manpower. A number of men working on the problem presented their views from which can be accumulated certain specific and practical suggestions in meeting manpower shortage difficulties. The means suggested have been and are being tried both in the oil industry and others engaged in defense work and have been found applicable. These speakers included Harry H. Power, head of the Department of Petroleum Engineering, University of Texas; J. R. D. Eddy, director of Vocational Training, State Board of Vocation, Austin, Texas; Henry LeBlanc, acting regional director, Region X of the Manpower Commission, Dallas, and Chase E. Sutton, division manager, The Pure Oil Company, Houston.

Occupational deferment is the most direct step open to companies in retaining vital workers. With full realization that military needs have to come first, companies should not hesitate to try to hold the minimum number of irreplaceable technical key men. The deferment clause in the selective service act was designed to handle special cases. Based on latest statements of the War Manpower Commission, it appears that this clause will only be effective insofar as vulnerable registrants are concerned, with a probable maximum extent of 15 percent of such registrants. It is well to note however that this included all essential industries.

Slow to Act

Although classed as an essential industry, at least in a number of phases, the oil industry has been slow to recognize this as a basis to ask for deferment. It has failed to establish itself as essential in its own mind, as well as the mind of the public. Workers have not been impressed with the fact that their work is definitely a war job, and it has not been made too clear that no stigma whatever should result from a highly trained worker remaining in his job as long as he can. The first impulse of every red-blooded American is to want to attach himself to some branch of our military service, the closer to the actual fighting front the better, but this impulse has no doubt worked grave injury to industry generally, and specifically to the oil business. This laudable, if misguided sense of patriotism has to be considered in proper allocation of manpower. The industry must educate its personnel to the fact of absolute necessity in keeping enough men on the job to maintain the oil output. If deferment has to be granted to accomplish this, draft boards should have all possible pressure brought to bear on them to give such deferments.

War Manpower Commission manning tables and replacement schedules, designed primarily to schedule withdrawal and replacements of manpower, should be used by oil companies. Briefly, the manning table is a form, which when completely prepared, aims to give an analysis of manpower utilization, training program, and upgrading possibilities. Also, it will, in connection with current selective service classifications, give a close approximation of the number of workers subject to induction.

Thorough analysis of manpower utilization is always profitable, and should be the underlying principle guiding those trying to keep all jobs filled. The well adapted worker can always do a better job than the one with limited fitness, and while it would not ordinarily be advisable to expect one man to do the work of two, under conditions such as now face us, there is a possibility of saving manpower through combination, coordination, and correlation of duties to the maximum. This possibility should be explored to its limits.

Training programs must of necessity be carried on when experienced workers are called, and have to be replaced. A beginning in this field has already been made by some states. During the past 10 years, for instance, 16,518 field workers have been enrolled in 960 classes in Texas, under the direction of the Texas Board of Education, Department of Vocational Training. As an aid in solving the personnel problem, a three-point program is offered at this time by this agency of the state:

1. Services of highly trained foremen conference leaders will be made available to companies desiring to train carefully selected personnel to be foreman conference leaders. Assistance will also be given in outlining and establishing a complete company program for continuous training of foremen. Individual classes will be set up for companies

that have 10 or more trainers at one location or who can bring them together to one location. For those companies that have need for but a few, institutes will be conducted at A. & M. College of Texas, or at some other convenient center. At such institutes men of national reputation in vocational work will be brought to discuss with the foreman trainers, problems created by changing conditions, as well as better methods of conducting training foremen programs.

2. The Texas Board for Vocational Education is pledged to whole-hearted cooperation in assisting in courses if such are necessary for upgrading employed personnel. If new courses are needed in addition to those already in use, the board will assist in outlining and developing such courses.

Up to the present time all emphasis on this type of training has been to upgrade regularly employed persons. The war emergency has created a new situation making preparatory training essential, especially with new employes above the 38-year age limit.

3. The United States Office of Education has approved for the duration, a modification of what is commonly called the part-time trade preparatory program. It is possible under this arrangement, to train a selected group to enter employment with any of the oil companies. Classes can be run at any time of the day or night and at such hours as may be convenient. Training programs of this type should be short and intensive to fit individuals for employment at the earliest possible moment. Further training can continue after employment. The following procedure must be carried out by companies wishing to inaugurate a part-time trade preparatory training program:

a. Companies, in cooperation with the vocational schools must analyze their employment needs and determine the numbers that should be trained for each specific operation or job.

b. Training programs should be set up on such a basis that persons enrolled in them may enter employment in from 6 to 12 weeks.

c. Companies with assistance of the vocational schools, must develop detailed, specific job analyses which will enable the training program to function.

d. It will be necessary for companies desiring this type of training to establish educational and physical standards necessary to enter employment so that the training can be limited to acceptable persons and will be as nearly 100 percent as effective as possible. It is suggested that if possible, the companies pass on all people desiring to take the training, and to tentatively agree to give those selected employment provided they complete the training.

Wide use of training schools is being made in other industries devoted wholly to war work. Shipbuilding concerns are the most notable examples. Two years ago when the gigantic shipbuilding program was launched, there were perhaps not more than a few thousand people in the United States who knew anything about ships, much less how to build them. Yet today, commissioned vessels are leaving the ways in yards scattered all over the nation, daily. They are being built for the most part by thousands of people who have learned their particular job within the past few months. Vocational schools are in continuous operation at most of the yards. The work is broken down into very small sections so that it becomes comparatively easy for beginners to master the particular operation they undertake, and with the help of a few foremen familiar with all details, these beginners take over in a very short time and turn out a commendable job. In no other way could the shipbuilding program be carried on. What has been learned there about training workers can surely be carried over into other fields as it becomes necessary.

Training Programs

These training schools in shipyards are carried on largely by staffs recruited from the yards. Proficient workmen are used as instructors. They teach at night or during other off-hours, are paid for their work, and as a rule are very successful in their teaching efforts. Their information is first-hand. They get to the core of their subject in short order, eliminating most of the theory accompanying usual routine teaching. They are after quick results, and if the persons being taught have ordinary aptness, the classes turn out good workmen in a very short time.

Reluctant at first to use women, shipyards have about-faced in their attitude in this respect. During the past year, thousands of women have been trained and employed in the various shipyards, and records of their performance indicate that they make most successful workers and that the quality of their work and their capacity for work is equal to that done by men. Undoubtedly oil companies will have to use women in greater numbers to take the place of men. Such a step is only following the pattern already set in numerous other war industries, and in other countries. Germany, according to reliable information, now has more than 16,000,000 women working in gainful occupations. In England, women are carrying on a great part of all war industry. Russian women are not only manning industry, but are said to be working directly behind the fighting lines, and even doing actual fighting.

Fortunately, American women are spared this latter extreme, but their efforts in industry will constitute a brilliant chapter in histories of the war. The oil industry has used women in limited activities for many years, in laboratories, for instance, and has come to rely on them. It should not be afraid to extend woman's usefulness to whatever other fields present the need. Willingness to pioneer has made the industry what it is today, and no ill-founded inhibitions or prejudices should stand in the way of calling women into whatever endeavors they can handle.

Statistics from manufacturing concerns throughout the nation show women to be as capable as men in various technical, mechanical tasks. In some instances they show greater precision and accuracy than men. They follow instructions more closely. They are eager to work and especially desirous of being able to do something in the war effort. As one example in support of this statement, recently Continental Oil Company announced that it would train women as testers in its control laboratory. Applications were received for two weeks following the announcement. Finally 135 women were given the rigid examination required, and now 28 are graduates of the training course. Through diligent study and actual practice they have mastered the subjects necessary to fit them for highly skilled jobs, and are doing scientific work in the control laboratory at Ponca City, Oklahoma.

There is no short cut to independent research work. Neither is there any substitute for highly trained technical workers who have reinforced their training with long years of experience. However, the example cited above, holds a clue to one step that can be taken to replace personnel required to do semi-technical work that does not necessitate extensive training. By breaking up the work into smaller units, it is possible to simplify tasks so they can be done by less highly trained and experienced workers. It may take more people, but if women can be used in such a plan, or if men beyond the draft age, or men not physically able to serve in the armed forces, can be turned to these jobs, the manpower shortage will at least be headed toward a solution.

However, unlike other industries the oil business daily is confronted with varying problems. No two wells are alike. Training programs can never become the teachers of knowledge that only experience can teach. Consequently, the industry must protect itself from the loss of experienced technicians if it is to produce the oil this war requires.

Electric Pilot Promises Better Oil Recoveries

New tool furnishes data of value in completion, workover and secondary recovery operations through ability to survey relative permeability and to control placing of acid for selective treatment of producing horizon

By FRANK BRIGGS, Staff Writer

ONE of today's many interesting tools is a device that utilizes an electrical current, in connection with two injected fluids such as salt water and oil, to: (1) determine a permeability profile of oil wells; (2) spot or locate acid at any desired depth or for controlled use in any selected zone in the producing formation; (3) find the top of mud or other chemical bridges; (4) relocate lost casing points or tubing bottom; and (5) determine the location of casing leaks.

This tool, the electric pilot, is a simple instrument that will efficiently perform these vital but difficult services that old-timers could only attack with a "good, round cussin' out," plus plenty of guesswork and long hours. The data provided by the electric pilot should result in better wells and increased recoveries. For instance, the determination of permeability profiles should be of much value in completion and workover practices, and also in secondary-recovery projects, by showing which sections of the pay horizon are most porous. This, coupled with the ability to place acid in selected zones, will afford new economies in well treating and have better results. With the industry's wells to be called upon to produce larger quantities of oil, this device may play an essential role in putting them and keeping them in the proper condition to produce at their utmost.

Technically, the "electric pilot" is a fluid interface locator which causes an electric circuit to close upon submersion of this instrument in a conductive liquid or to break the circuit upon contact with a non-conductive medium or liquid. Simply, it is nothing more than a gadget lowered into the well by means of an insulated cable through which current will flow if the pilot is in (conductive) acid or salt water and will not flow if it is in (non-conductive) oil. Thus, at the point where acid ends and oil begins, technically referred to as the "fluid interface," the pilot will only be lowered slightly into the conductive liquid before a current is noted or raised slightly into the oil for the current flow to be broken. By holding the pilot electrode at the intermediate point of electrode contact and knowing the depth of the pilot in the well, the interface is located.

Appearing similar to nothing more complicated than a bronze rod with short rubber sections wrapped around it, the locator consists of a tube about five feet long upon which are spaced two electrodes insulated from the body, or tube. In electrical parlance, an electrode (and there must be two to do any good) is a point of entrance or exit for the current leaving or entering the electrolyte; the electrolyte being a liquid conductor of electricity which in this case is the acid or salt water injected into the well. The cable lowering the locator into the well contains an insulated conductor wire which is connected to the upper electrode; the upper and lower electrodes being connected together by means of a highly resistive wire. A small generator at the surface sends a current down the insulated wire in the cable but before the circuit can be completed it is necessary to establish electric connection between

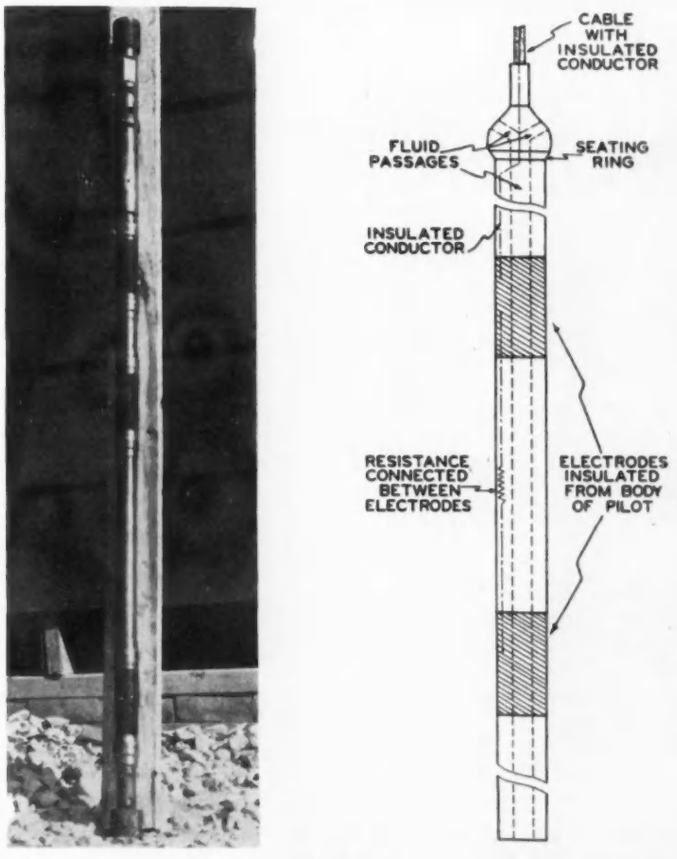

FIGURE 1
The fluid interface locator has insulated electrodes attached to the body which complete an electric circuit with the surface when they are in contact with a conductive liquid.

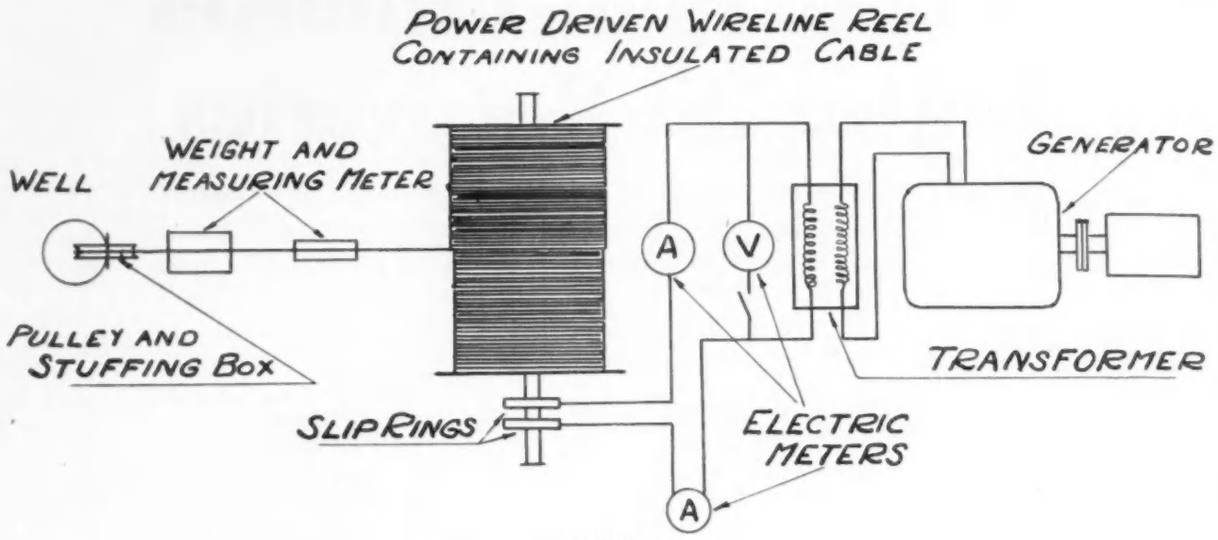

FIGURE 2

Arrangement of electric pilot equipment and wiring diagram of the electrical circuit

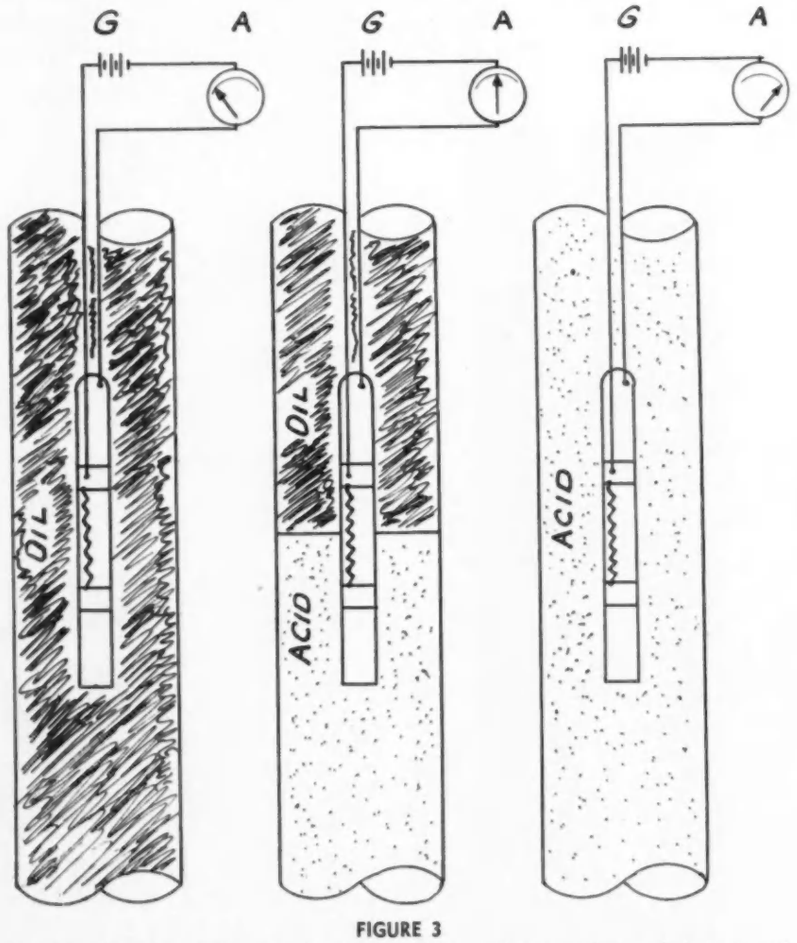

FIGURE 3

Operation depends upon the fact that acid (or salt water) is a conductor of electricity, oil a non-conductor. With both electrodes in oil, no current is registered; when the fluid interface is between the two electrodes, the circuit is completed but because of the highly resistive wire connecting the electrodes, the current flow is halved. With both electrodes in acid, the maximum current flows; thus the surface meter indicates the relative position of the fluid interface.

one or both of the electrodes and the body of the locator. This the acid, acting as an electrolyte, does and the oil, as a non-electrolyte, does not. The returning current passes through the cable.

Method of Operation

The acid is pumped down the tubing while oil is introduced simultaneously into the tubing-casing annulus. In the case where selective acidizing is desired, the tubing is bottomed to the desired depth, the pilot seated in the tubing end and acid entering from the surface passes through ports in the top of the pilot, down the hollow center and out through the perforated tailpiece. After passing through the pilot, which is suspended below the end of the tubing, the acid rises on the outside and upon reaching the first electrode, causes the electrical meter on the surface to show a half-scale deflection. Upon reaching the upper electrode, the acid face causes a full-scale deflection on the surface meter, thus indicating that the resistance connecting the two electrodes has been shorted out.

Suppose it is desired to learn the permeability profile of a well; then after finding the pay sections that need opening up with acid, it is planned to treat those zones only.

The crew spots the pump trucks. In this case, the tubing has been removed from the well, the formation to be surveyed has been covered with salt water and oil has been pumped in on top. The "pilot" is lowered into the well and as soon as the water-oil interface is located, the well is filled with oil and the interface gradually lowered at a constant rate as the pressure is applied by the

surface pumps. Salt water is a good conductor and is used in running profiles instead of acid.

The operator observes one precaution; the first few barrels of oil run into the well are treated to prevent emulsion at the interface. Such emulsion would tend to make the electrical surface meter cut diddoes when it should be serious. As the pilot follows the interface down, the operator notes from his control cab, the rate of fall of the interface, the quantity of fluid being injected into the formation, and the pump pressure under which it is injected. Doing this for the entire depth of the open hole section, the profile is determined.

The operator has noted the depth of the pilot every minute; this is plotted into a curve—depth vs. time. The operator has also noted the rate of flow (or injection) of oil into the tubing; he notes the position of the pilot whenever a change occurs in this quantity. He has the pump injection pressures and also notes the position of the pilot whenever a change occurs in pressure. The information is plotted into curves.

As the oil-water interface goes down, water is forced into all of the permeable zones below and this is constant . . . until the top pay zone is passed by the interface. If there are no more porous sections below, there will be a marked decrease in the injection rate and the pump pressure will rise sharply. Of course oil will be forced into the top pay. Water can be forced into the formation much easier than can the oil and therefore there will be a sharp decrease in quantity taken into the formation and a sharp increase in pressure as the water is forced below the porous zone. Should more porous zones be below the first one, there will be a proportionate drop in flow into the formation and a proportionate increase in pressure. This is what the plotted chart shows.

FIGURE 4
Rear of Electric Pilot Truck.

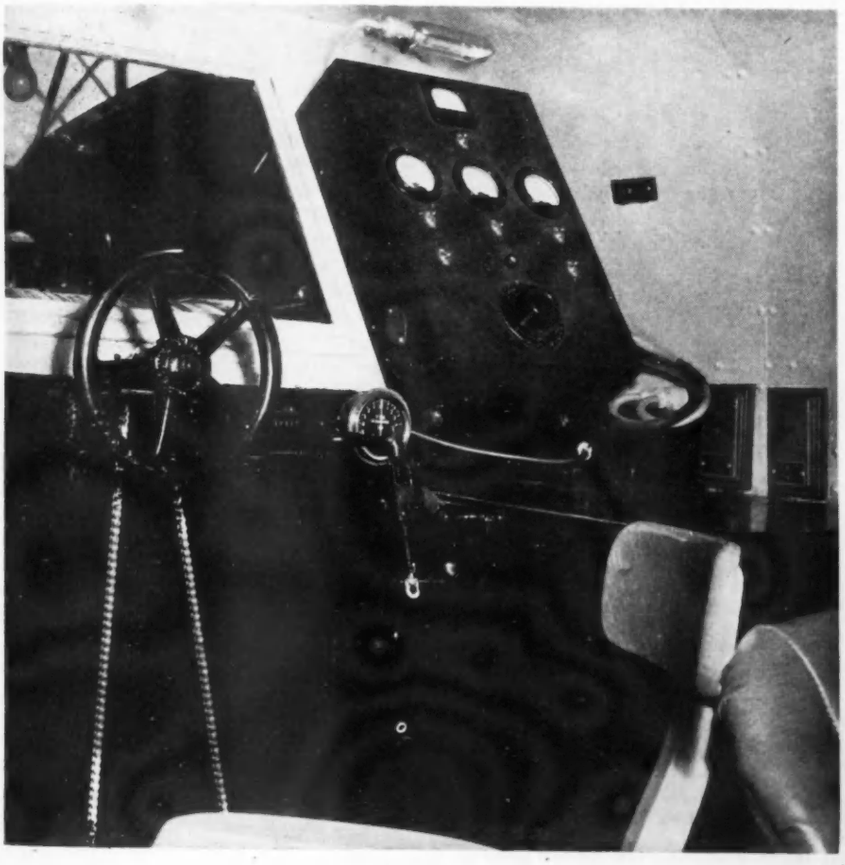

FIGURE 5
Operator's cab on truck from which operations are directed

Some wells have such a porous formation that no amount of injected fluid will effect a very high standing fluid column; the formation will pass the fluid as fast as it can be introduced. A profile in this case can be determined by experience; the field crew, after determining the subsurface conditions will decide on the best means of obtaining a fluid interface, will locate it with the pilot, and from there on will find the rate of flow into the various formations. In this case, there will be no pump pressure data.

Observation of the accompanying chart shows that the rate at which the interface is lowered changes (slows down) at 5235.5 feet; thus from the

point of beginning (which is inside the casing) at 5121 to the depth of change is a distance of 114.5 feet. This takes 30 minutes; therefore 30 divided into 114.5 gives 3.82 as the total rate of interface decline in feet per minute. Since the pipe contains one gallon of liquid per foot of length, this means that the total volume of fluid introduced into the formation is 3.82 gallons per minute. The next point at which the curve changes is 5244 feet—or 9.5 feet from the last point of change. The time required here is 4 minutes; therefore the rate of flow for this portion of the curve is 9.5 divided by 4 or 2.37 gallons per minute. Subtracting this from the total rate of flow (3.82-2.37) gives 1.45 units of permeability for the top pay section. The percent of total permeability is obtained by dividing 1.45 by 3.82 which gives 38.0. Thus the percent of total permeability of each of the lower zones can be determined.

Selective Acidizing

Now to put acid in the zone where it is needed, which in the example case is below the top porous section. The pilot is spotted at a depth between the upper and lower pays; acid pumped down the tubing and oil is discharged down the casing. The interface between the two liquids is held, by means of the pressure pumps on each (the oil and the acid) and as determined by the pilot, at the position where the acid can only enter the lower zone.

After the pilot is spotted at a certain position in the well, his electric meters tell the rest. If the acid section is above the top of the pilot, the ammeter dial will show a certain flow of current; if the acid is below, the dial will show no current. Should the interface be between the two electrodes on the pilot, the meter reading will be half scale—and this is the position at which the interface is held by means of regulating the pressure in the oil or the acid or both.

One of the specially equipped trucks is connected to the tubing, discharging the acid; the other is connected to the casing and takes care of the oil assignment. The pilot has its own control truck and the operator in charge directs the activities from this cab and confers with each of the pressure truck operators by means of an interphone communication system. He watches two pressure gauges, the oil and the acid; he keeps tab on his ammeter to make sure the interface is where it should be; he notes the position of the pilot when taking profile surveys.

It is possible to locate casing leaks or bad seats, also lost casing or tubing points, as well as the top of mud or other chemical bridges.

The procedure for locating a casing leak is almost the same as that of running a permeability profile, except that the pilot is inside the casing.

Locating a lost casing point is purely a simple electrical procedure. As the pilot is run into the well, contact is made with the casing walls by wrapping a projecting wire around the pilot body. This gives a definite reading on the meter. As the arms of the spring wire scraping the casing wall pass the casing point, contact is suddenly broken and the electrical circuit changes abruptly. This is the indication that the pilot has passed the casing seat and is in the open hole. Tubing bottom may be found the same way.

Plugging a bad gas section above the oil pay constitutes many hazards and requires the best experience at most; however, the procedure sounds easy. A very heavy mud, or chemical plug, is introduced into the well until the oil pay is completely covered and protected. The top of this covered section is faithfully located by the pilot; chemical plugging material or "gels" are then discharged into the well and forced into the gas zone.

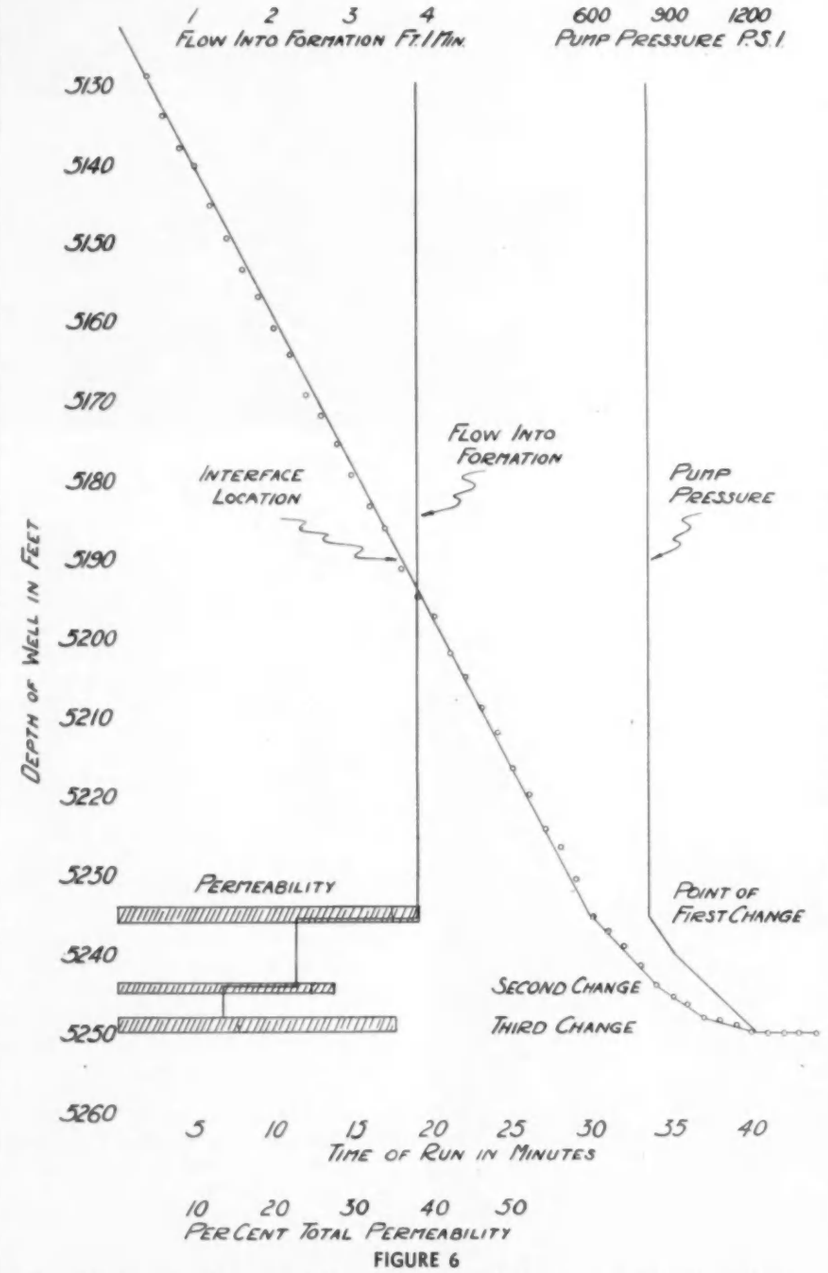

FIGURE 6

The plotted results of a permeability profile made with the Electric Pilot. The distinctive breaks in the curves for pump pressure and flow into the formation vs depth substantiate the location curve breaks for the fluid interface. Percent of total permeability is indicated by the bar charts and is computed by measuring the fluid injection rate into all parts of exposed formation, as described in the article.

Development and Control Of Oil Reservoirs

PART 2

By S. E. BUCKLEY AND R. C. CRAZE
Humble Oil & Refining Company

THE first part of this article, which was published in the May 3 issue, discussed the types of reservoir drives and their significance, identification and proper development. This, the second and concluding installment, is devoted to control of reservoir performance and well spacing.

This paper is not meant to be technical, but is directed to the practical interpretation and application of conclusions reached by the API Special Study Committee and Legal Advisory Committee on Well Spacing and Allocation of Production after years of study.

The article was presented as a paper before the Southwestern District meeting of the American Petroleum Institute Division of Production, held in Houston, April 29-30, 1943.

QUOTING from the conclusions of the API Special Study Committee on Well Spacing and Allocation of Production, "Production rate is one of the most important factors governing oil recovery, and production at excessive rates commonly causes waste." The key to this conclusion is afforded by the further statement, "Since the types of drive . . . differ in efficiency, a major objective of all efficient production practice is to produce oil under the most efficient type of drive. Most effective of the methods of controlling the type of drive is by the control of the rate of production."

It is not necessary to explore here the technical details underlying these conclusions. The simple fact remains that control, and by control is meant restriction, of the rate of production increases the ultimate oil recovery. However, a brief examination of the relationship between rate of production and reservoir behavior may help to show the importance of this factor.

Recalling the depletion feature of the dissolved gas drive in contra-distinction to the displacement feature of the gas cap and water drives, we find that this depletion can take place for one of two reasons, as follows:

a. Because of the character of the reservoir and its contents there exists no free gas cap to expand into the oil zone and water influx is physically prevented by lack of sand continuity.

b. The oil zone is depleted before the gas or water has time to compress and maintain a well-saturated, shrinking oil zone.

The effect of production rate hinges on this time factor. Considering the case of the water drive, the water must flow through the sand and the rate at which it can flow is limited. Thus, if oil is produced faster than water-entry can take place, depletion occurs. In the extreme the result is production by dissolved gas drive instead of by water drive.

In the case of the gas cap drive the situation is somewhat similar. Depletion of the oil zone at a rate greater than that at which it can be replenished by oil from the upper part of the structure creates gas channels throughout the oil zone, permitting the escape and exhaustion of the gas cap along with the gas liberated from solution before the gas, with the aid of gravity, has been able to effect the displacement of substantial quantities of oil.

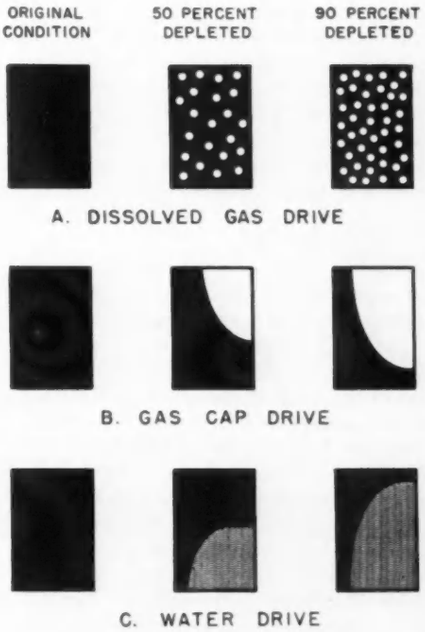

FIGURE 6
Oil-zone depletion under different drives.

In either case, and hence in practically all reservoirs, the inevitable result of unrestricted production rate is production by the mechanism of dissolved-gas drive.

The effect of production rate on the reservoir pressure of a water-drive field is shown in Figure 7. It may be seen that at a production rate between 12,000 and 15,000 barrels per day the pressure stabilized at approximately 1800 pounds per square inch. Following curtailment of the rate to 5,000 to 6,000 barrels per day, the pressure gradually rose to approximately 1900 pounds per square inch. It is obvious that in this field water influx has been able to keep pace with the oil production.

Control of Gas Production

Control of rate of production alone will not necessarily suffice to insure production by a displacement drive. It is necessary also to control the progressive movement of the displacing gas or water and to prevent their premature dissipation. Referring again to the conclusions of the Special Study Committee, it is found that "waste also results from excessive production of water and gas."

It is obvious that under an expanding-gas-cap drive it is necessary to work over, to restrict the production of, or finally to shut in up-structure wells to prevent the loss of the free gas which is the source of the drive. Unless such control is exercised, low rate of production will be of no avail and the field will revert to dissolved-gas drive simply because the gas-cap drive is dissipated to the surface rather than used to displace oil.

All production of gas is not objectionable. That amount dissolved in the oil must be produced in any event. It is only the production of free gas which may cause waste. The magnitude of the

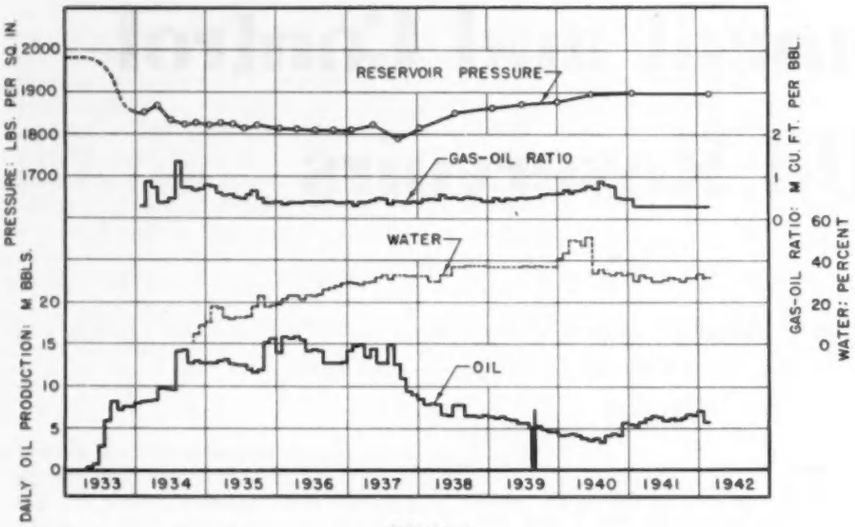

FIGURE 7

*** Effect of production rate on reservoir pressure in a water-drive field.**

free-gas production in many fields can be appreciated from the fact that in the southwestern portion of the United States in most fields shallower than 10,000 feet the dissolved gas is less than 1000 cubic feet per barrel of oil.

In a dissolved-gas-drive field, it sometimes is difficult to determine whether free gas production is a symptom of or a cause of the drive. In this type of operation the free gas occurs throughout the oil zone as a result of its release from solution in the remaining oil. For this reason it cannot be excluded mechanically from producing wells in any part of the structure. Its production, therefore, seems inevitable if oil production is to continue. On the other hand, production of this free gas accelerates the pressure decline and thus accentuates the conditions leading to the high gas-oil ratio. Control of this type of field becomes a rather delicate matter. The only possibility for control of the over-all field gas-oil ratio and resultant modification of the drive is to allow the gas to segregate in the reservoir under the influence of gravity, and simultaneously to avoid its dissipation, both while it is moving up-structure and after it has reached the crest.

Unfortunately, little experience is available with this type of control and no simple rules can be laid down. There does exist ample evidence of the formation of local gas caps in some gas-drive fields, and in others noticeable segregation has been found to result from reduced rates of production. Rarely, if ever, however, has a field of this type been so operated as both to permit this segregation and to control the free-gas production to take advantage of the resultant modification of the drive. This whole subject of the control of dissolved-gas-drive fields requires more study by technologists and its eventual solution will require the utmost cooperation from all operators. Until such time as more is known of this matter, we may be guided by the fact that good operating practice will include production of such fields at low rates, coupled with the greatest possible restriction of gas production.

In a water-drive field, the production of free gas must also be closely controlled, even though this gas is not to be used for oil displacement. Since the reservoir pressure in a water-drive field remains high, free-gas production can come only from an original gas cap. Dissipation of this cap or any reduction of its size may permit the water drive to force oil into the former free-gas area. Because only a part of this oil can ever be recovered, the inevitable result is a loss in ultimate recovery. Although there is no disagreement on the fact that such oil losses can occur, the possible magnitude seems to be generally unappreciated. Most operators have considered free-gas production costly only when it has resulted in allowable penalties, and have evaluated remedial measures solely on the basis of increased per-well allowables.

Under certain conditions a limited amount of free gas may be produced from any field containing an original free-gas cap without causing appreciable waste. In the absence of artificial stimulus in the form of gas or water injection from sources extraneous to the reservoir, no field can be produced without decline of reservoir pressure. In a properly controlled water-drive field, this decline may range from 10 percent to 25 percent of the original reservoir pressure. This pressure decline resulting from oil production causes any free gas to expand and thus permits the removal of a limited quantity without causing contraction of the free-gas area. The amount of gas used in normal drilling operations within the field seldom is enough to cause concern, and the practice of using free gas for this purpose should not necessarily be condemned as wasteful.

Control of Water Production

Production of water in a water-drive field becomes wasteful only when it reaches such proportions as to interfere with the successful operation of the water drive. Substantial quantities of water are produced in nearly all water-drive fields, and at some stage in the operation the production of relatively large volumes of water will always be necessary to flush the remaining portion of the reservoir.

Bearing in mind that the rate of entry of water into any reservoir is limited and that this rate depends among other things upon the reservoir pressure, bearing also in mind that production at a high pressure level is desirable to avoid a shift to the dissolved-gas type of drive, it is readily apparent that the production of water must be balanced with the oil-production rate against the pressure which it is desired to hold. If the oil rate is low, the water rate may be comparatively high without causing waste. On the other hand, if maximum oil rate is required, water production must be curtailed.

Figure 8, in which water production is plotted against oil depletion for a number of water-drive fields, illustrates the magnitude of the water production usually to be expected.

The combined effects of excessive gas and water production, coupled possibly with too high a rate of oil production, are shown in Figure 9. The average gas-oil ratio in this field has exceeded 6000 cubic feet per barrel, and by 1942 the water production was approximately 75 percent of the total fluid or three times the oil production. As a result, the reservoir pressure has declined almost 900 pounds per square inch.

One method by which the drive may be modified is by the injection of gas or water into a reservoir. When such operations are conducted during the primary production of the field, they are commonly called pressure maintenance. Such operations are not always necessary or even desirable and are not universally adaptable. In the fields in which the methods are required and are properly employed, however, they may sometimes result both in increased oil recovery and in reduced operating expenses.

Gas Injection: Gas may be returned to a reservoir during primary production to increase the ultimate oil yield in one of two ways:

a. In a dissolved gas drive field or in a field showing tendencies to approach

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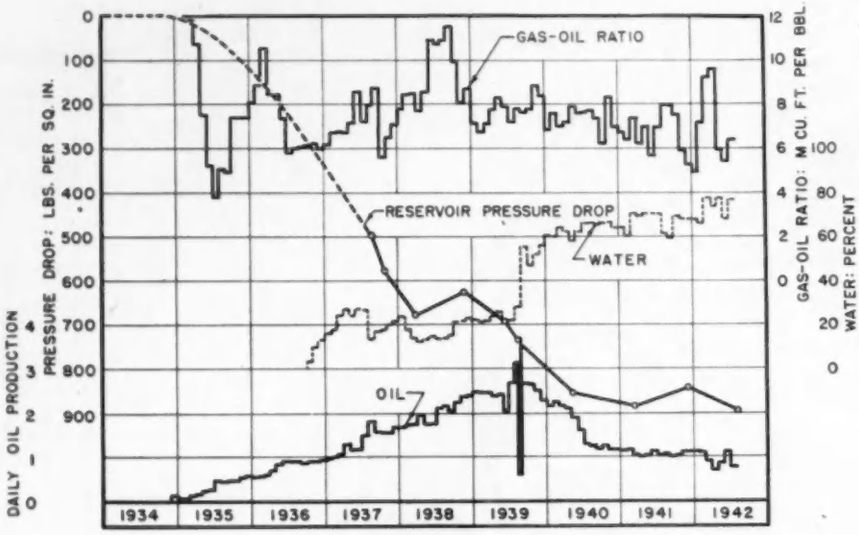

FIGURE 9
Effect of excessive withdrawals in a water-drive field.

dissolved-gas-drive conditions, gas may be returned to modify the drive and thus to increase the ultimate recovery directly.

If the reservoir structure and sand conditions are suitable, such gas is preferably returned to the crest of the structure to create a free-gas cap, thus bringing about a gas-cap drive. If conditions preclude the creation and control of a free-gas cap, the injected gas may be employed in a fashion entirely similar to that used in secondary gas-drive operations.

Three distinct advantages usually accrue through the return of gas during the primary operations as opposed to normal depletion followed by secondary recovery:

1. Gas usually is available at lower cost during the primary operations. Gas may not be available at any price after depletion, and in any event must be obtained from an outside source if the primary gas has been exhausted.

2. Operating economies result from the fact that the total period of operation is shortened.

3. Characteristics of the oil favor greater recovery before the pressure is exhausted.

In the event that a gas-drive operation is to be conducted rather than a gas-cap drive, these advantages may be partially offset by the fact that if sand conditions are suitable for low-pressure operation, lower gas-oil ratios are involved in low-pressure operation.

b. Gas may be returned to the reservoir, not to change from dissolved gas drive operation, but as the cheapest available method for control of free-gas production. Increased ultimate recovery in this case occurs only through prevention of the loss of oil which otherwise might result from free-gas production.

One question which frequently arises is whether or not it is desirable to return gas in a water-drive field. Ordinarily, such practice is of questionable merit. Under two conditions, however, it is good practice:

1. In a water-drive field containing an original free-gas cap and in which conditions preclude the control of free-gas production, gas return may be the only method available to prevent contraction of the free-gas area. The return of gas under such circumstances may materially increase the ultimate recovery.

2. Under the pressure of war demands or other emergency demands for oil, it may become necessary to produce certain water-drive fields at rates exceeding those ordinarily considered efficient. Under such circumstances the net volumetric withdrawals from the reservoir may be reduced by return of the produced gas, thus preserving the characteristics of the water drive. This process amounts simply to producing a field simultaneously under an expanding gas cap and under a water drive. Generally, this practice can be considered a relatively short-time expedient, and it may not be desirable completely to exhaust a field by such a combination.

Water Injection: Because of the attention which has been given to the problem of excessive water production in the East Texas field and to the return of water to the Woodbine sand to offset its production, many operators have become concerned over the production of salt water in other fields.

It has been demonstrated that underground disposal of salt water is a practical method for getting rid of a waste material. However, where a choice exists between injection of produced brine into a suitable shallow salt-water sand or into the producing formation from whence it came, there must exist some demonstrable benefit from the latter to justify the additional expense involved. It is false to assume that merely because the practice is sound in the East Texas field it is universally necessary or desirable. The conditions in each field must be given individual study.

At the risk of oversimplification, it might clarify the issue somewhat to review briefly the reasons for and effects of return of water to a producing formation.

Study of water-drive fields has shown that the permissible rate of production is limited by two factors:

a. The pressure cannot be maintained at a desirable level if the volumetric rate of production exceeds the rate at which water can replace the produced fluids at the desired pressure level.

b. In some fields the water can maintain high pressure even at relatively high rates. In such fields control of reservoir pressure is of no concern. The bottleneck on oil production is the rate at which water can effectively flush all of the sand and not channel through the more permeable streaks.

Thus we have water-drive fields which are deficient in water and those which have an excess. In those which have an excess, return of water to the producing horizon does not contribute materially to the ultimate recovery. In those fields which are deficient in water, such return permits a higher current rate of oil production at the same pressure level. In a severely prorated field excess water influx may be available at the permitted production rate and water return be unnecessary; demand conditions may change, however, and the condition reverse.

The effects of operations on the reservoir pressure in a number of fields are shown in Figure 10. The curves are drawn to show the percentage decline in reservoir pressure as a function of the percentage oil depletion.

Curve A shows the pressure in a water-drive field now substantially depleted. The high degree of pressure maintenance is obvious.

Curve B represents the pressure behavior in a water-drive field in which the withdrawals have been reduced by return of gas and in which the rate of oil production has been severely curtailed. The reversal in the pressure trend immediately followed the inauguration of gas return and the continued rise is due to water influx.

Curve C shows the pressure delcine in a field which has no water drive but in which all of the produced gas has been returned to the crest of the structure.

Curve D shows the pressure decline in a water-drive field in which the rate of oil production has been high and in

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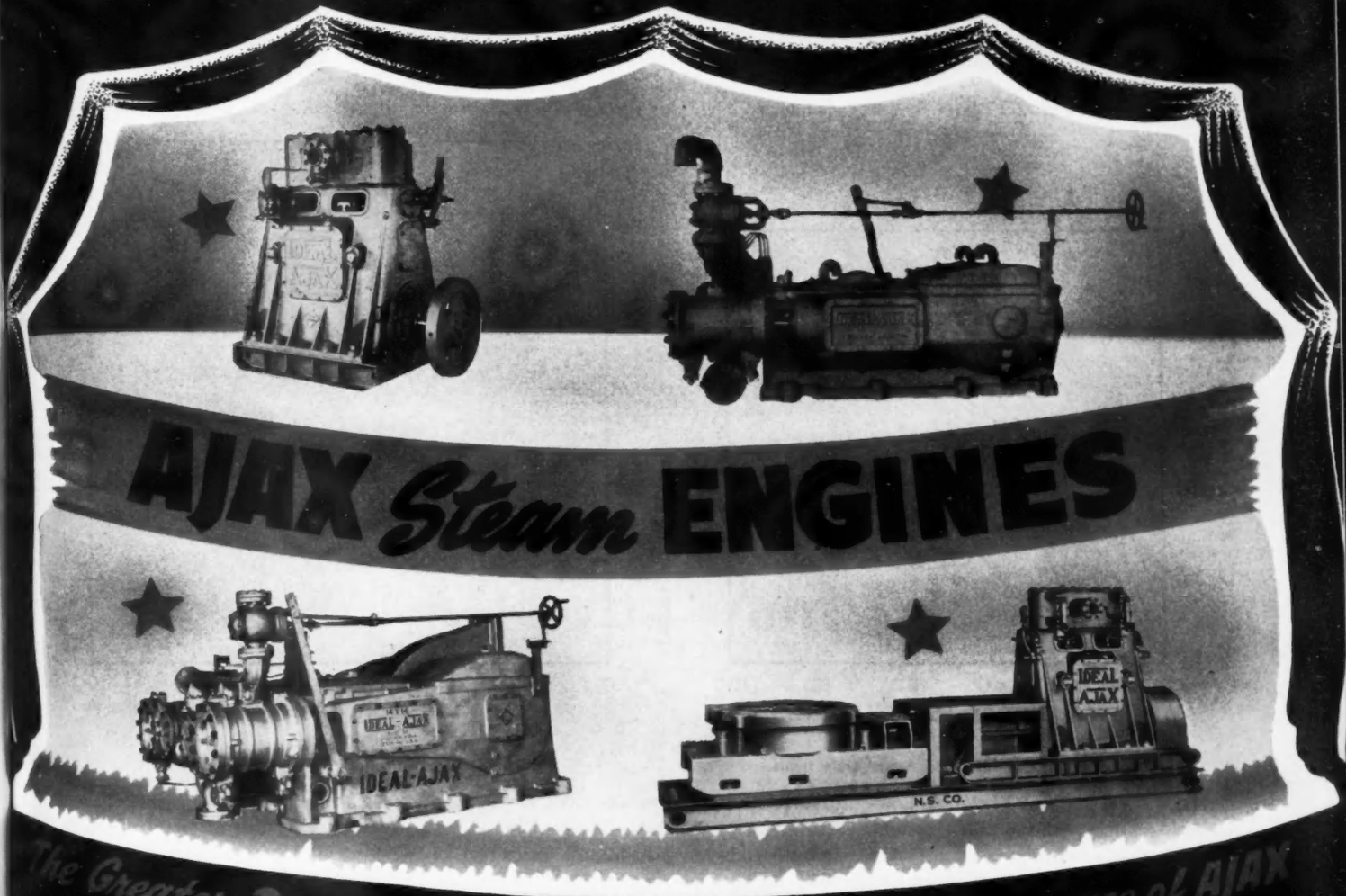

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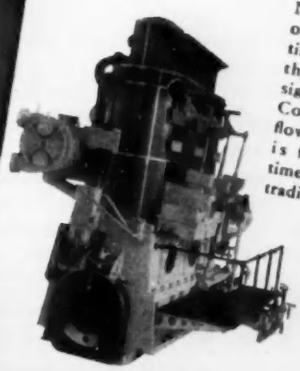

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which there has been considerable production of gas and water.

Curve E shows the reservoir pressure in the East Texas field, which is produced entirely by water drive.

Curve F represents a dissolved-gas-drive field in which there has been no evidence so far of any water drive.

Curve G represents a water-drive field in which the rate of production of oil, gas, and water has been excessive.

Comparison of curve A and curve G shows clearly the contrast between the

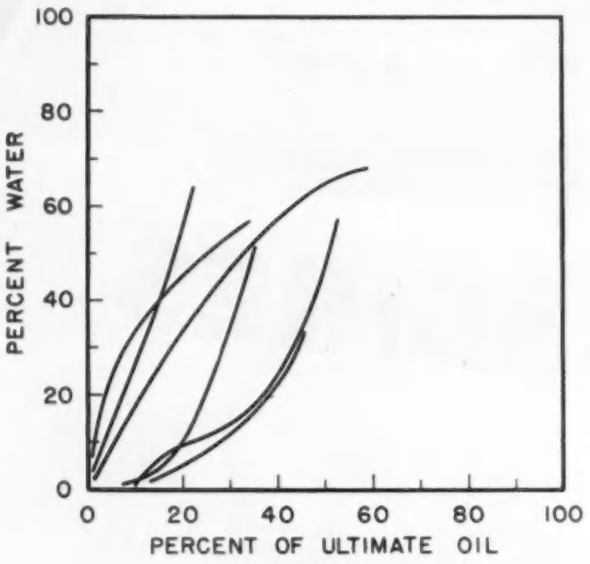

FIGURE 8

Water production in typical water-drive fields.

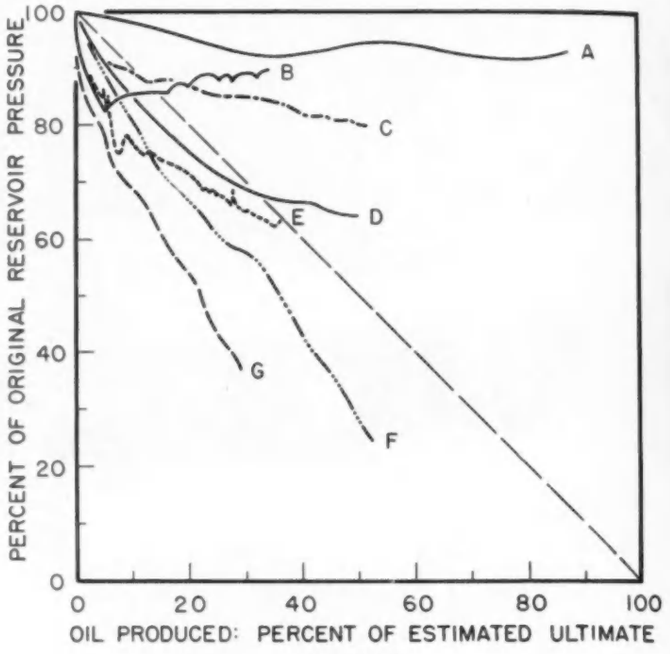

FIGURE 10

Reservoir-pressure variations in typical fields.

effects of good and bad operating practice in fields with substantially the same inherent characteristics. The pressure behavior shown in curve G resembles that of curve F, a dissolved-gas-drive field, rather than that of the other water-drive fields. Curves A, B, D, E, and G, all of which are for fields with natural water drives, show the degree to which such fields are subject to control.

One question which arises concerning the dissolved-gas drive is whether or not the ultimate recovery is necessarily irrevocably reduced by such operation. A categorical answer which will fit all fields cannot be given to this question. The records indicate that the great majority of the fields produced under dissolved-gas drive have been abandoned when the pressure was exhausted.

Under certain conditions, and apparently in comparatively few fields, natural forces may modify the drive in the latter stages of depletion. Such a change may take place in one of two ways, as follows:

1. In a field which has an inherent water drive but which has been produced under dissolved-gas-drive conditions by virtue of the fact that oil has been produced at a rate greatly exceeding the rate of water influx, the time may be reached eventually at which the natural and inevitable decline in production rate permits the water to catch up. There then may follow a long period of stripper operation under water drive, accompanied by the production of large volumes of water.

Probably the best known examples of fields in which this sort of change has occurred are the fault line fields in East Central Texas—Mexia, Wortham, and Powell. It is not possible to determine what the ultimate recovery from these fields would have been had they been produced differently. However, it is reasonable to presume that had these fields and others like them been produced at lower rates and in such manner as properly to control and use the water drive from the beginning the ultimate recovery would have been somewhat greater. Furthermore, it is probable that the same ultimate recovery could have been obtained in a shorter time and at a lower cost.

2. In some fields having highly permeable sands and favorable structural conditions appreciable gravity drainage has taken place. This drainage has become particularly noticeable when the reservoir pressure was substantially exhausted and the rate of oil production correspondingly reduced.

The outstanding example of this condition is the Oklahoma City field. The reservoir pressure in this field has been practically exhausted under dissolved-gas drive, but wells recently completed on the flank make appreciable quantities of oil from a low-pressure, well-saturated oil zone, apparently replenished solely by gravity drainage.

In consideration of the natural modifications which may augment the ultimate recovery obtained by dissolved-gas drive, the most important thing to be borne in mind is that the effects of these modifications have been appreciable only in those fields in which the conditions for such modification were ideal. These are the very fields in which it would have been easiest and most profitable to use a natural water drive or expanding gas cap to full advantage during the primary operations.

The normal expectancy from a dissolved-gas-drive field is the ultimate recovery attending pressure exhaustion, and the only remedy usually is secondary recovery.

Emphasis has shifted during the last 10 to 15 years from the well as the source of oil to the reservoir as the source. Instead of trying to complete each well with the maximum possible potential and striving to maintain the well at maximum productivity, the shrewd operator has relegated the individual well to the background and now devotes his effort to making the reservoir yield the utmost of which it is capable, not in current producing rate but in ultimate recovery. Leaving aside the considerations involved in the often-heard remark that under ideal conditions and given unlimited time one well could drain a complete reservoir, and considering the real problem of how to space wells in an actual reservoir, this

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problem is readily reduced to practical elementals.

It has been shown in the preceding sections that there are two ways in which an oil reservoir may be operated. The oil zone can be depleted in place, or part of it can in effect be moved around and treated as a separate and controllable entity. The latter practice yields more oil. Undoubtedly, then, there must be two distinct well-spacing problems.

Our concern here is the ultimate density required effectively to drain the structure. The problem of each individual operator is to develop each lease and to secure a fair share of the allowable production. We may expect, then, that wells usually will be drilled throughout the field on a somewhat regular pattern and will not be confined to that portion of the reservoir where they will be most effective. Thus unnecessary wells will nearly always be drilled, i.e., wells which contribute nothing to the utimate recovery of the field, but which nevertheless are necessary to permit each lease to secure its proportion of the total allowable.

The total number of wells required in a water-drive or gas-cap-drive field is that which will permit adequate control of the movement of gas and water to accomplish uniform displacement. Moreover, enough wells should be drilled so that when the field is produced at an efficient rate the individual-well-production rate is not excessive. In a field of this type the rate of production of an individual well may be considered excessive if such rate causes excessive free-gas or water production, or if it results in depletion of the section of the reservoir in the immediate vicinity of the well at a rate materially faster than the depletion of a section of the reservoir a greater distance away. Stated differently, even in a water-drive or gas-cap-drive field, an individual well may be produced at such a rate as to cause rapid pressure decline in the vicinity of the well bore and thus result in a localized dissolved-gas-drive condition. Such a condition is to be avoided.

The problem of spacing wells in a field of this type is primarily the problem of each operator to secure a fair share of the field allowable and to secure a fair allowable for the field as a whole. In most fields the difficulty of equitable distribution of allowables is enhanced rather than reduced as the well density is increased. Moreover, because of pressure for higher rates of production in fields drilled unnecessarily densely, an excessive number of wells frequently leads to waste rather than to increased ultimate recovery.

We cannot present here a simple formula which will tell the correct well spacing for all fields. Experience has shown that in many water-drive fields 20-acre spacing and 40-acre spacing resulted in reservoir behavior similar to that obtained with 5- and 10-acre spacing. The ultimate recovery is not directly related to the number of wells but depends entirely upon the completeness with which the advancing water or gas flushes all parts of the oil zone. Forcing the water or gas to invade all parts of the sand is a problem of geometry and hence of subsurface geology. Each field thus requires individual study, and this study cannot be made until a reasonable number of wells have been drilled and logged. Experience shows, however, that in the average field of this type more wells usually are drilled than are necessary, that within the range of spacing commonly employed the ultimate recovery is substantially independent of well spacing, that concentration of a large number of wells in a small area is bad practice, and that more wells than the necessary minimum is more apt to lead to loss than to an increase in ultimate recovery.

The role of the well in a dissolved-gas-drive field is somewhat different from its role in a field operated under one of the displacement drives. In the dissolved-gas-drive field, depletion starts at the well bore and works outward. The section of lowest pressure, of the maximum amount of gas out of solution, and probably also of lowest oil saturation is immediately around the well bore. The zone of partial depletion rapidly works its way outward from the well, so that soon the entire developed portion of the reservoir contributes to the production. (Under the displacement drives the region around the well bore remains substantially saturated with oil, while depletion occurs at the advancing gas or water interface.)

The objective in the dissolved-gas-drive field is to decrease the pressure throughout the reservoir to the lowest practical value. It is the pressure decline which liberates the gas that forces oil from the sand, and the pressure decline at any point in the reservoir is an index of the degree of oil depletion at that point. The maximum ultimate recovery in a field of this type results when the reservoir pressure is decreased to zero throughout. Recovery stops, however, when the wells have reached their economic limit. The productivity of a well in a field of this type continuously decreases as a result of the reservoir-pressure decline, of the decrease in surrounding oil saturation, and frequently because of sanding up and plugging. A single well in good repair may be able to exhaust the pressure in a large area to a lower value by the time it is abandoned than can several wells in poor condition.

Beyond a certain reasonable number of wells required to develop the reservoir, the additional ultimate recovery obtainable by material increases in the number of wells is incredibly small. Long before the field is abandoned, any increase in the ultimate recovery which might be obtained can readily be determined from the behavior of the older wells. Within the ranges of spacing commonly encountered, i.e., up to 40 acres per well in the United States, it is unlikely that the additional oil obtainable by doubling the well density will pay for the additional wells, and if oil is used as a drilling fuel, more may be consumed than will be returned. It is readily appreciated that the number of wells directly affects the maximum possible rate of oil production under a dissolved-gas drive or stripper operation where each well is producing at capacity, but this increased total rate merely hastens depletion and does not in itself indicate increased ultimate recovery.

One extremely important point which frequently has been overlooked and which should receive more consideration is the fact that in any type of field, so long as proper operating practices are employed, the ultimate recovery from the field as a whole cannot be decreased by delaying development to ultimate well density. The many problems of inter-lease drainage and the losses which may result on an individual lease through failure to develop or delay in development are beyond the scope of this paper. What is meant is simply this: if a field is of such nature that 160-acre spacing will suffice to explore and delineate it, and if 160-acre spacing will supply enough wells to yield the field allowable without excessive per-well-production rates being required, then it is possible to continue production at 160-acre spacing until such time as increases in field allowable or changes in well characteristics make more wells necessary. The ultimate recovery will not be significantly different if half of the reserves are produced with 160-acre spacing and the remaining half with 20-acre spacing than if the field is initially developed on 20-acre spacing. Operation under the wider spacing will supply at no risk the information required to determine the proper ultimate density. Such operations may reveal that in a particular field which might normally have been drilled to 10- or 20-acre spacing, 40-acre spacing will be entirely adequate. The wider initial spacing followed by later drilling may increase the cost per well and the operators may have greater difficulty in securing equitable allocation, but the possible savings may well offset the higher per-well cost and justify greater cooperation among the operators in arriving at a sound uniform spacing pattern and sound allocation.

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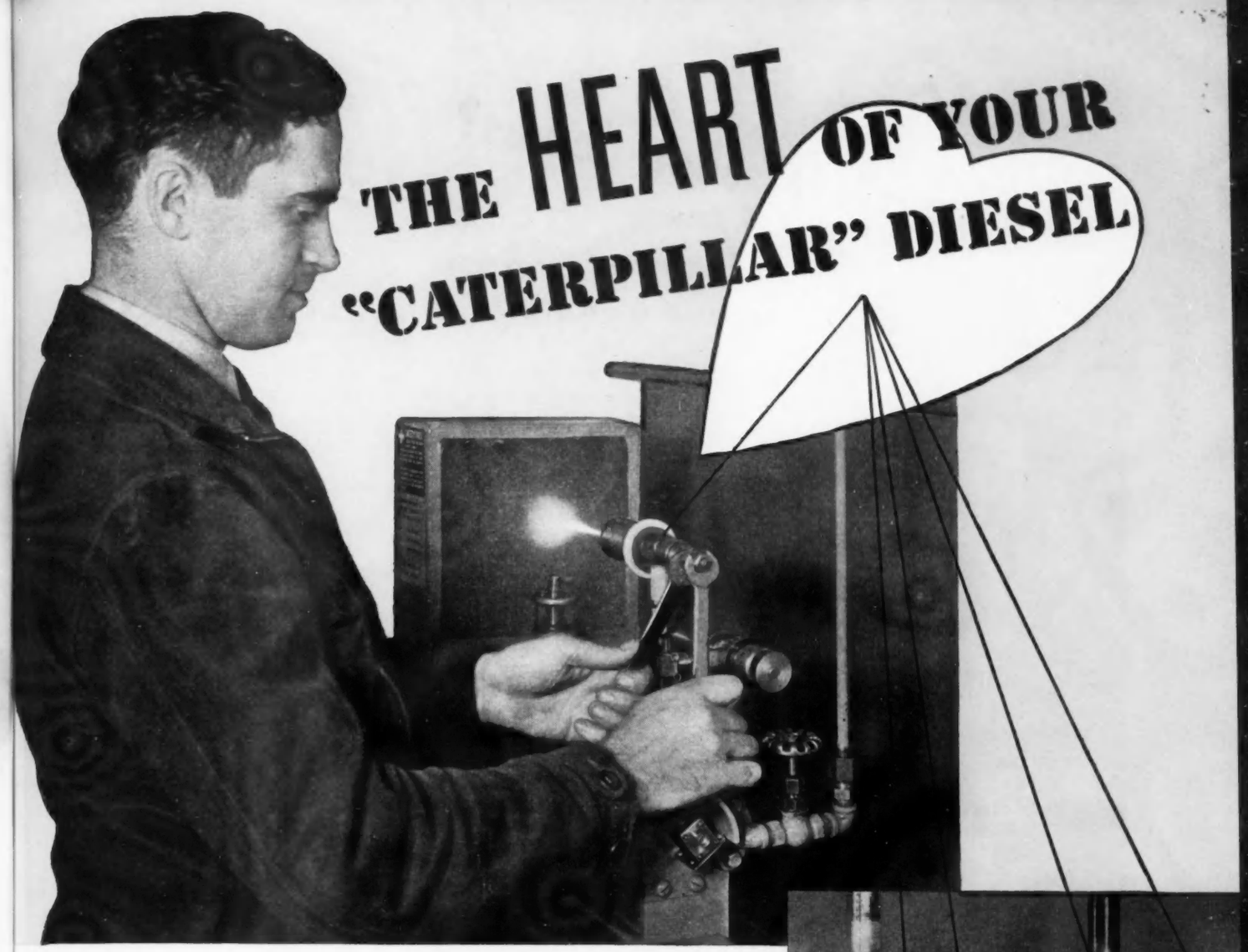

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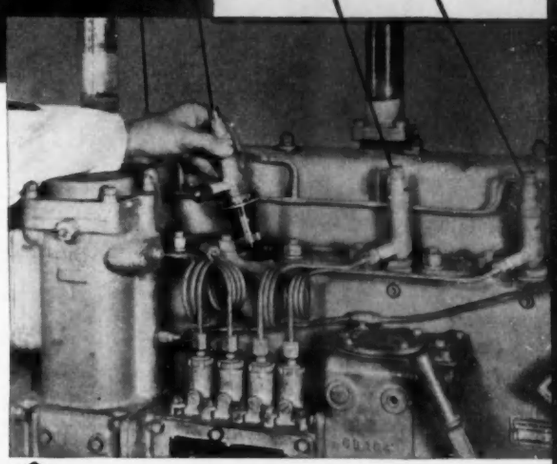

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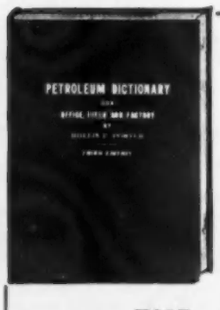

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given to methods by which the holders of small leases may produce oil without their proportions of a total field allowable becoming so excessive as to compel the drilling of unnecessary wells to permit larger tracts to obtain a fair allowable, and the cooperation of various state regulatory agencies in this regard are rapidly removing many of the difficulties which formerly prevented sound well-spacing programs.

Reservoir Engineering

The impression may have been given that the proper control of oil reservoirs is simple enough so that any capable operator can use good practices without much effort. Qualitatively, it is easy to point out certain elementary features of good and bad operation. The quantitative application to any specific field, however, is a complex and difficult matter and the assumption that all fields are alike is both absurd and apt to be costly. It is imperative that each field be given individual and competent technical study. Furthermore, the technologist cannot invent facts. The more that is known about a specific reservoir the better the resultant interpretation and control of its behavior. Adequate information on the producing zone and its contents, on the production of oil, gas, and water, and on the reservoir pressure is particularly essential. Unless such data are complete and reliable, even the best technologist may be misled.

By way of summary, certain principles governing the efficient exploitation of oil fields have been agreed upon by leading technologists. They have discovered that there is such a thing as good practice. This phrase is not mere window dressing. Good practice actually exists and has paid dividends. However, good practice in a particular field requires intelligent analysis of that specific field and no amount of generalities will substitute for competent geological and engineering analysis based on facts.

It should be readily apparent that efficient operation requires proper control of a whole reservoir and not just of a part thereof. Good practice on one lease and bad practice on another does not necessarily average out to give a reasonably efficient average. The question, then, may well be raised as to the manner in which an operator whose properties comprise only a small fraction of a field can see to it that the whole field is operated efficiently. Obviously, his only recourse is cooperation with other operators, in the acquisition and exchange of necessary engineering data and in the acceptance and promotion of common good practice. The incentive lies in the possible greater return at less cost.

Dual Completions Are a Sound Production Practice

Claims that adoption would result in but little saving of steel, would unduly disturb markets, and would constitute operating difficulties and hazards are completely denied

By E. O. BENNETT, Chief Petroleum Engineer
Continental Oil Company

DUAL completions are not a wartime panacea for all ailments of the industry, but are simply the result of sound thinking and good engineering practice in connection with simultaneous production from two zones in one well bore. However, since there are real and effective savings to be made in critical materials which do directly affect the war effort, and since your story "Some Objections to Dual Completions" (page 9, THE OIL WEEKLY, April 19, 1943) is so much at variance with actual conditions existing in dual-completion work, it should not go unchallenged at this time.

In the first paragraph it is stated that dual completions would completely upset present proration systems and that the permitting of higher allowables to dually completed wells would require redistribution of market demand, taking away from single-zone wells and fields and adding to dual or multiple-zone wells and fields.

On the theory proposed in this argument, no more wells of any type should be drilled any place because each new well would be a liability against those wells already completed. An oil well must be considered as a vertical pipe line, simply providing a means of moving oil from a supply zone to the surface. If there should be more than one supply zone in overlying position under the same surface acreage, there can be no difference in the effect of moving oil or other hydrocarbons from the separate zones by two wells, one within the other (dual completions), than would exist if separate wells were drilled to each horizon. The theory or idea advanced sounds like one that might be expected from an operator who owned only single-zone pools, and for this reason alone does not want the producer who may be fortunate enough to own acreage in multiple-zoned areas to enjoy the benefits of his rights and fortunes of his exploratory ability.

In paragraph 2 it is stated that it would be impossible to police the output of wells producing from two zones, thus opening the door for unscrupulous chiseling at the expense of neighboring lease owners.

The inference in this paragraph is that the petroleum industry is full of unscrupulous operators who would use dual completions as a means of chiseling. The strongest proponents of dual completions have records of being the most prudent operators in the industry, and their operations have certainly not justified the thoughts expressed. Suggestions of cooperation rather than inferences of chiseling would do much to assist this great industry whose products are so vital and necessary for the winning of the great international conflict in which we are now involved.

Paragraph 3 states that once dual completion of wells is started, all wells capable of being so completed or recompleted would be finished in this fashion. The steel used in such a campaign would affect a large amount of new well drilling, and that the savings in steel are exaggerated. This paragraph also states that serious hazards exist in killing producing wells to effect recompletion.

It is agreed that the thought conveyed in the first sentence of paragraph 3 is reasonable and proper, and that in the interest of good engineering, sound production practice, economy, and conservation such completions should be made.

The statement that the steel used in a campaign of dual completions would offset a large amount of new well drilling is not understood. It is obvious to anyone familiar with dual-completion practice that the total amount of steel used in a dual completion is only slightly greater than that required for a single well completion. Since steel available is the predominant limiting factor affecting new drilling, it is readily seen that dual completion will have an opposite effect to the one propounded in the discussion of paragraph 3.

The ideas expressed about the hazards of killing a producing well are not concurred with. The hazards that exist in the drilling and producing of high-pressure wells are well known and understood; and any prudent operator will so equip his wells that any necessary work on them may be undertaken after the wells are placed on production, the killing of such wells included. The industry's progress over the past decade in deeper drilling and the operation of higher-pressure areas is ample evidence of its ability to cope with any hazards involved in dual-completion work. It is believed that even the antagonists to dual-completion work are well qualified to conduct such operations, and the fears they express appear to be a smoke screen.

Paragraph 4 states that the redistribution of market demand would create complicated transportation problems in some instances, resulting in more recovery in some areas than pipe lines could handle, and at the same time would reduce production in some fields below line capacities.

A close study of market demand will reveal that it is governed by transportation facilities and quality of products produced and not by the method used to raise such products from subsurface strata to lease tanks. Therefore, the connection between market demand and dual completions is irrelevant.

Paragraph 5 states, "There is no reason why allowables from existing wells cannot be increased where producing ability exists, thus making more oil available without expending any steel whatsoever."

If the first part of the above statement included the words "without waste" after "where producing ability exists," it would be concurred with. Statements issued by PAW do not indicate that the required production can be obtained from and sustained by present producing wells, and for this reason, have indicated the number of new wells required for such purpose.

Dual completion of many existing wells requiring very little additional steel will make more barrels of new oil available per ton of new steel than can be obtained by any other known pro-

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In paragraph 6 it is stated that increased production resulting from higher allowables of dual-completed wells would discourage wildcatting and the discovery of new reserves. This would react adversely against this cardinal tenet of our present national policy.

If present producing wells could supply the entire demand for petroleum products for all purposes for an extended period, there would be but little need for wildcatting. This situation, however, does not exist; and since reserves are now being depleted at far too rapid rates, more wildcatting than ever before is needed. Since, as above discussed, dual completions will actually provide the most oil with the least amount of steel, their use will be of direct aid to the so much needed wildcat program proposed by PAW; as steel otherwise required to obtain oil in certain producing areas may be used for wildcatting.

Paragraph 7 reads, "Producing through tubing and annular space between tubing and casing would be inconsistent with engineering concept that a well should be allowed to produce only through tubing."

There are no fixed engineering "concepts" in the petroleum or any other progressive industry. This is readily observed if one will compare engineering practice of today with that thought good 25 years ago.

The efficient operation of many dually-completed wells also serves to prove the ideas voiced in paragraph 7 as erroneous.

Paragraph 8 says, "Difficulties would be encountered in artificially lifting from two zones."

The above statement is too broad to merit any serious consideration. It will be recalled by most people in the petroleum industry that it was not many years ago that pumping below 3000 feet was considered impossible. Qualified engineers worked out the answers to deep-well pumping and the results speak for themselves.

Life of Packers

Some of these same engineers have already developed suitable means of artificial lifting of oil from multiple-zone wells.

Paragraph 9 states that the ability of packers to prevent commingling of fluids over a long period is questionable.

Since dual completions have only been in use for a few years, the ultimate life and holding ability of packers is not yet determinable. The design of packers used and their methods of installation are such that qualified engineers very definitely believe that the packers will last for the life of the well.

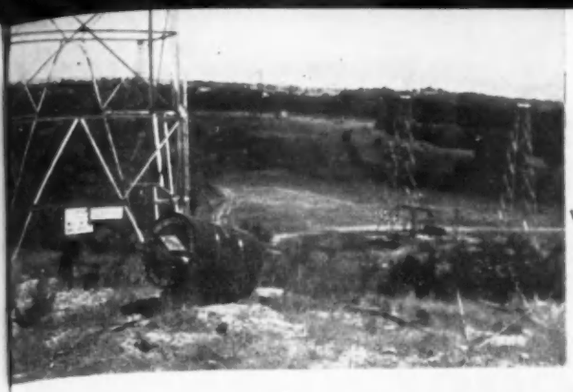
Paragraph 10 reads, "Increased hazard from sanding up and higher work-over costs would result."

Suitable equipment is now in use in dual completions to readily remove sand accumulations in either the annular space or tubing without any appreciable increase in cost per barrel produced.

Paragraph 11 states, "If one zone sands up, goes to water or fails to produce, it would be necessary to kill the well to work over the zone that failed. Consequently, ultimate recoveries as well as current production might be reduced."

The first sentence above is agreed with; however, it is not felt that the effect upon ultimate recovery will be any more detrimental in the case of a dual well than would exist if the same conditions arose in two single wells in corresponding zones. The normal down time of any well is but a very small percentage of its total producing life.

In one area on the Gulf Coast the steel saved by the use of dual completions, over that required for two single wells to the same zones, is approximately 120 tons. Failure to effect such saving when there is a shortage of steel material for our fighting forces is, in effect, equivalent to sabotaging that tonnage of war engines that are already fabricated.



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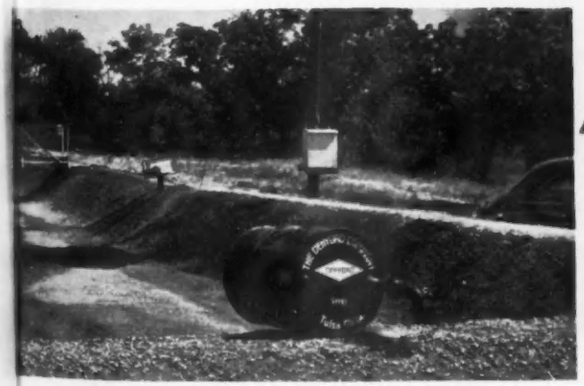

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Portable Crude Oil Treater Efficient and Economical

PRODUCING companies are relying more and more upon the ingenuity of field personnel to provide that spark of inventiveness (or makeshift, if you will) necessary for "carrying on" with materials at hand. No longer are they "fussy" about specifications. Getting the job done without lost motion is the target.

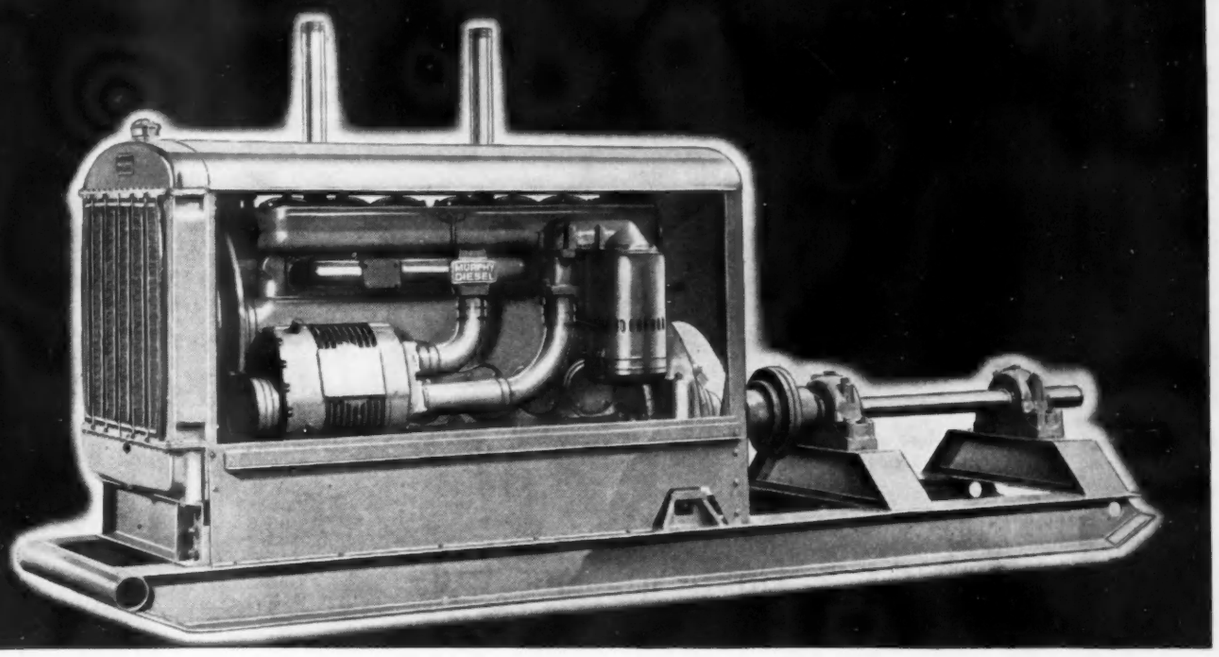
One of the major duties around leases producing much paraffin with the oil is that of constantly and regularly cleaning flow lines, tubing and tanks. This job may have been relegated to a contractor in the past; he is gone to war now, like the materials he used to use so freely. Or maybe, there were plenty of boys in the lease gang who had to have something to do so they were given the job of manually cleaning the paraffin deposits. But they are gone, too, and maybe one man and a truck driver now must keep the lines open.

On a particularly bad paraffin lease, the operations are conducted by two men and the oil must be treated and the lines cleaned regularly. To facilitate this they have constructed a very efficient yet simple and inexpensive heater from lease materials. The shell of the treater originally was used for similar purposes; a riser pipe attached was allowed to remain as the smokestack. The heating coils, of which there are two tiers of three rows each representing an overall length exceeding 60 feet, are made of scrap 2-inch pipe. Instead of using prefabricated turns or threaded angle connections the coil corners are of an all welded construction. True, they are sharp and probably introduce greater friction losses than in the fabricated turn type, but the oil passage is slowed somewhat, thus giving it more chance for heat absorption. The complete burner and coil assembly slides into the shell and is held in place by means of a cross-bar welded to the coils in the rear which is bolted to a plate attached to the hull. The burner, salvaged from an old boiler, is aimed to place the flame between the upper and lower tiers of coils.

Mounted on an all-welded skid frame of old 4-inch drill pipe, the heater is easily moved from one location to another. Special connections on lines have been installed and when oil is to be treated it is only a matter of connecting the heater into the line, attaching the burner to the nearby gas source. Although the temperature of the outcoming oil has never been determined, the heater has never failed to accomplish its purpose; it is estimated that the treated oil has a temperature between 170 and 180° F.

Portability, efficiency and low cost are the three principal attributes embodied in this oil treater. Salvaged drill pipe make up the skid and supports; second hand line pipe, welded into inexpensive coils, provide heating surface for the oil flow.

POWER FOR THE "PEAK LOADS" . . .
ECONOMY FOR THE LONG PULL



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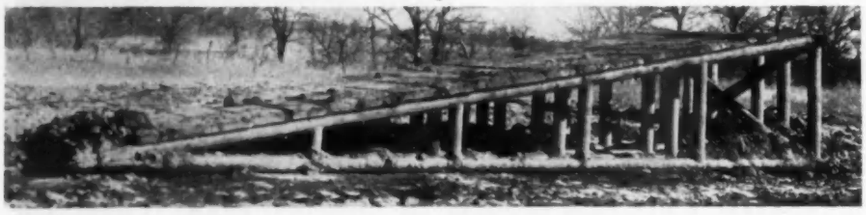
PRACTICAL OPERATING *Hints* FOR THE DRILLING RIG

$5.00 will be paid for each illustrated acceptable contribution. Mail to The Editor, THE OIL WEEKLY, *Houston.*

1. LOADING RAMP

Speeds Transfer for Automotive Units



Reinforced slope to truck-bed height makes transfer of tractors and skid-mounted units matter of driving onto platform and cuts need for heavy lifting equipment in rig moving.

WHEN a crane is not available, loading of heavy equipment, such as engines, rotary table and drawworks, can be facilitated with a portable ramp. Tractors and other powered equipment can be driven right up on the bed of the transport truck. The ramp is made of pipe welded and braced to withstand the heaviest kind of service. One end is built high enough to reach to the bed of a standard truck, the other tapers to ground level. Heavy planking forms a renewable floor.

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Eliminates scarce measuring lines —works off Sand Line. Quickly attached. Accuracy to within plus or minus two inches on 4,500 Ft. wells. Available for immediate delivery. Ask your Supply Store.

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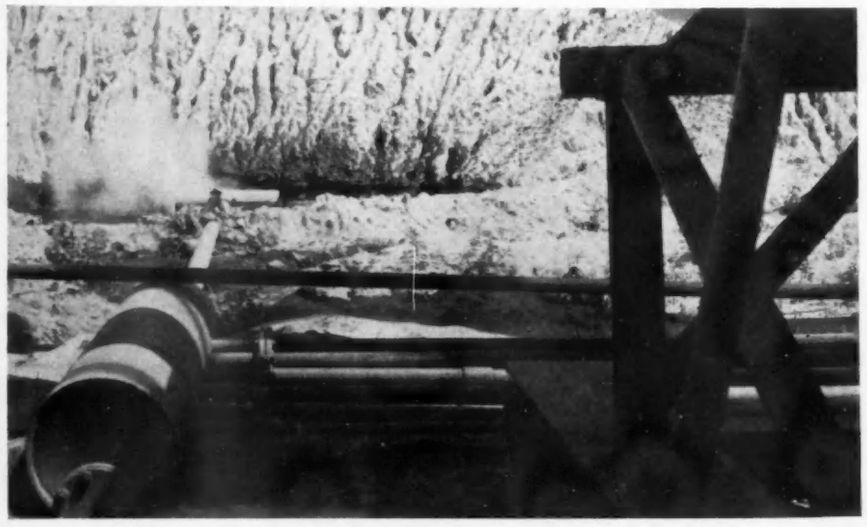
CASING HEADS • PUMP JACKS
OIL COOLERS • STUFFING BOXES
PACKERS • CASING CLAMPS

2. BOILERS

Dual Expansion Cuts Blowdown Effect

AN ingenious combination of expansion drums is effectively used to muffle the roar of boiler blowdown and prevent waste of condensed fluid. The individual boiler blowdown lines are brought to the side of the first drum, and tied to it with standard flange unions, the various nipples being set perpendicular to the side of the shell and aligned along the side of the unit.

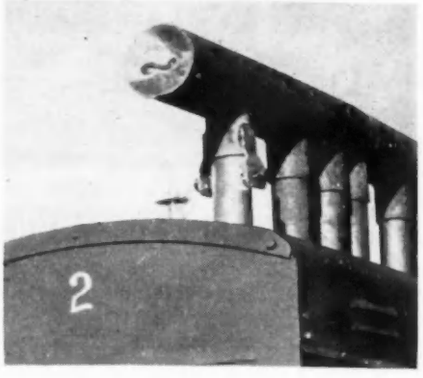
The outflow pipe is set in the end of the drum, carrying the steam and entrained water to the second expansion unit, located over the edge of the shale pit. This second drum is closed on the end opposite the blowdown line, with a series of small holes in the lower portion of the shell. The water and wet steam are ejected through these holes, by this time having been slowed down and stripped of power by the double expansion, changes in direction and long travel to reach the atmosphere.



Use of two drums in blowdown line provides expansion space and absorbs most of power in blowdown steam, permitting condensate to collect in pit and reducing noise of operation.

3. EXHAUST LINES

Latch Absorbs Load Of Extended Outlet



Holddown ears on last exhaust riser anchor long pipe against wear due to vibration.

TO CARRY exhaust fumes beyond the shelter over the derrick floor, it is frequently necessary to extend the manifold a considerable distance beyond the

1893 1943

After Fifty Years

CARTER CONTINUES SEARCH FOR FREEDOM'S OIL . . . . . .

On May 1, The Carter Oil Company completed fifty years of service. On this, our golden anniversary, we wish to express gratitude for the measure of success that has come to us. . . . Today the nation is engaged in the greatest fight in its history. We humbly re-dedicate our resources, our skill, our experience, and our whole-hearted effort to the vital war-time task shared by all in the petroleum industry—finding and producing the essential petroleum! . . . May our efforts contribute to a speedy victory for the United Nations and an early return to a more normal way of life.

. . . . . THE CARTER OIL COMPANY, Tulsa, Oklahoma

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SUCKER ROD WIPER

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NOT BIG BUT STRONG!

Size: 2"; **Weight:** 12 lbs.; **Test Pressure:** 6000 lbs.; **Safety Factor** (at 6000 lbs.): 7.3 . . . **that's UNIBOLT!** (A ring joint flanged union of the same size and test pressure weighs 54 lbs. and has a safety factor of only 6.5.)

THORNHILL-CRAVER COMPANY
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last support on the engine itself. When this is true, the unsupported end places heavy, alternating strains on the pipe and fittings used to tie the individual stacks into the header, and rapid wear and quick failure result.

One contractor revised the header hookup by fitting the nipple on the cylinder farthest from the free end with heavy lugs, over which fit a pair of latches or ears, carried on the header itself. The joints between header and nipples are then simply slip connections instead of being flanged or screwed, the nipples at either end of the engine being made extra heavy and firmly secured to support and prevent lever action by the long pipe.

4. LUBRICATION

Reservoir Insures Mud-Pump Rod Oil

OILING the rods of a mud pump has been simplified with a simple attachment made from a short joint of 6-inch pipe and a small lead line. The reservoir is bracketed to the bedplate of the pump so that it remains in place whether moving or in operation.

Ends are closed with flat plate welds, a short collar at the top near one end serving as filler plug. This plug has a fine-mesh screen as an oil strainer.

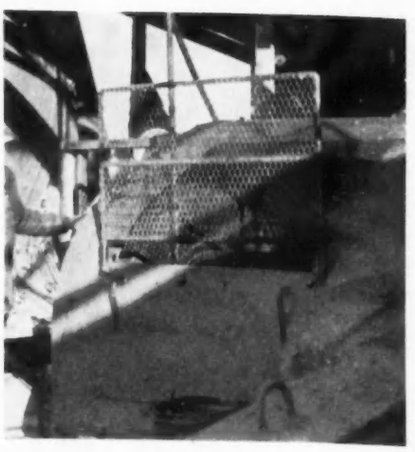
The feed lines are attached to threaded openings above the fluid end packing gland with directional leads which apply the oil to the top of the rod just behind the stuffing box. The oil draining from the rod is collected from the trough below in cans which are emptied frequently into the reservoir, the strainer preventing dirt from entering. Oil supplied to this reservoir is obtained from engine crankcase drains when lubricant is changed at required intervals.

The drum is attached to the power unit, and is moved without breaking any connections.

5. SAFETY

Screen Guards Gap In Drawworks Front

VISIBLE supervision of the action of the drilling line on the drawworks drum is necessary to prevent mis-spooling and the accumulation of slack which, if not checked, can quickly throw a loop onto the derrick floor and create hazardous working conditions. Low-built drawworks fronts simplify supervision, but



Frame with wire mesh checks throw of slack line without reducing inspection of drum action.

add to the hazards of loose line, as well as making it easier for material or tools from the floor to find their way into the drum and damage the line.

By building a guard, with frame of sucker rod and face of heavy hardware cloth, one contractor in effect carries the front of his drawworks casing high, snubbing any whip or slack which may come in the line, yet permitting close check of winding conditions, space at the bottom permitting wrap adjustment.

The guard is made to fit into sockets for bolting to top braces, being readily removable for access to the drum or line.

Container fabricated from pipe holds oil for piston-rod service, and provides gravity flow without need for frequent replenishment of supply. Large filler provides quantity check.

☆ ☆ ☆ ☆ WASHINGTON ROUNDUP ☆ ☆ ☆ ☆

OPA Refuses Crude Price Raise and Repercussions Start

»

Material Situation Is Becoming More Critical

»

PIWC Will Continue Efforts to Get Better Crude Price

»

By B. F. LINZ
Washington Correspondent

☆ ☆ ☆ ☆

PRICE Administrator Brown's denial of a general increase in crude prices was the outstanding oil development of the week in Washington, with indications that it may have repercussions in Congress, where there is talk of forcing a revision of the ceilings by legislation.

Brown's letter denying Ickes' request for an increase came as PIWC assembled for its monthly meeting. Dismayed but not discouraged, the council voted to keep on with its attempt to secure relief.

A highlight of the council meeting was an official luncheon at which checks aggregating $2,433,185 were turned over to the four relief organizations to which the industry donated the cash "profit" realized through its scrap rubber drive of last summer.

The materials situation is becoming increasingly critical, it was disclosed during the week, and may have an adverse effect upon PAW's drilling program. To aid the small independent operators, PAW shortly will establish stock depots at various points throughout the country, at which supplies of tubular goods will be stored.

Rail shipments to the East Coast hit another new high during the week ended May 1, when they averaged 980,241 barrels daily, but the inventory situation again deteriorated with stocks dropping to 26.3 percent of normal, it was reported May 7 by PAW.

With military demand at high levels, with warnings that it would continue to increase—talk of an imminent invasion of Europe spreading among government officials—Ickes disclosed that there is little prospect of any improvement in the stock situation or relaxation of ration restrictions in the near future.

With operations of the big-inch stepping up, tankcar shipments during the final April week hit 962,798 barrels daily, while boxcar shipments of kerosine in drums to New England averaged 17,443 barrels. Tank cars reaching New England gateways delivered 161,758 barrels a day, it was stated; this was a decline of 13,640 barrels from the previous week.

PAW Plans Pipe Stock to Aid Small Wildcatters; WPB Cuts Steel Quotas

Plans of PAW for establishment of stock-piles of tubular goods at some 25 or more strategic points throughout the principal producing regions are being whipped into shape, with a possibility that the scheme may be launched the end of next month.

The main idea is to provide assured and quick sources of well material for the small independent wildcatter and an emergency supply for all operators. The large operators, both major and independent, schedule their requirements well in advance, operating under the controlled materials plan of WPB, and so are able pretty well to insure their supplies, but the smaller adventurers are not in position to do so and there has recently been much complaint of the difficulty of getting tubular goods where and as needed.

Data worked up by WPB indicate that a relatively small number of operators account for about half the total wildcat footage drilled. Such operators can schedule their activities and place their orders with the mills four or five months in advance. The stock-pile system is planned to aid the operators not in this group.

It is understood that several problems have yet to be worked out, including the question how the stocks shall be handled at the several points, in view of the existence at those points of established supply houses.

Meanwhile, overshadowing plans to make supplies more readily available is the disclosure by WPB that requests of the claimant agencies for steel for the quarter beginning July 1 is considerably in excess of the now-anticipated supply.

It was disclosed that the requests of the 16 claimant agencies for finished carbon steel ran to 21,000,000 tons, with approximately only 15,000,000 tons available for allocation.

As a result, H. G. Batcheller, director of the WPB steel division, said, the requests of the various agencies will be cut by from 14 to 40 percent. The cuts tentatively decided upon—definite determinations will depend on prospects near the beginning of the quarter—were disclosed for a number of agencies, the Navy being cut 20 percent, the Maritime Commission 22 percent, and ODT 40 percent.

The figure for PAW was not given, but it is understood the oil industry will be cut about 30 percent.

The situation with respect to alloy steel is but little better, and the several agencies stand to be cut one sixth or more, with PAW expected to be in line with the others.

The oil industry's allocation for the current quarter, it was said, is about 10 percent under the amount requested by PAW, but is expected to provide enough to enable the drilling of the period's share of the wildcats planned for this year, although it will not be possible to use all new material for this purpose.

The outlook for the third quarter, however, is not encouraging, although several weeks will elapse before final determinations are made, in the course of which there may be changes in the supply-and-demand picture.

Just how the reduced allocation will be distributed will have to be worked out by PAW when the actual figures become known, and the break-down will have to be on the basis of "first things first" since, it is pointed out, it is not possible to limit the amount of pipe to be put into a pipe line which must be completed before it serves any purpose.

The plan for setting up stock-piles was outlined in detail by D. R. Knowlton, PAW director of production, at the meeting of the PIWC committee on production.

Knowlton explained that an agreement has been reached with WPB for a total of 20,000 tons of material to be carried at the mills, primarily to meet the immediate demands of operators drilling less than 40,000 feet of hole per year but whose operations are of such scope as to permit them to buy in carload quantities. The mills are now engaged in rolling part of this stock.

In addition, field stocks totaling 10,000 tons have been approved to be carried at various points which will be announced within a short time. These stocks will consist of casing, tubing and line pipe, with drill pipe also carried at some points.

General rules governing the acquisition of material from these emergency stocks will be as follows:

All materials to be acquired under the terms of P-98-b.

The stocks are to be considered primarily as emergency stocks for use in exploration and wildcat drilling by small independent operators whose normal consumption does not permit them to buy in carload lots.

Tubular material in the stocks may be drawn upon by small independent operators as replacement and repair stocks as well as for wildcat use.

A major operator who normally buys carload quantities may, in an emergency occasioned by late delivery or other

cause beyond his control, have access to the stocks when needed for a wildcat well. Determination as to the existence of the emergency is to be at the discretion of the district director of production.

No material may be withdrawn from the stock without the approval of the district director of production. The district director of materials will consult with him in all cases with regard to any material to be issued from the stock.

Preference Rating Order P-98-b to Be Revised

A new Preference Rating Order P-98-b is soon to be issued, replacing the present order which does not provide a procedure for the obtaining of preference ratings and allotment numbers for the purchase of capital-investment materials.

Under the new order, all of the operators' dealings will be with the PAW district offices as soon as they can be lined up for that work. All applications for tubular goods will be transmitted to the district offices for the assignment of preference ratings and allotment numbers, and those necessary will be forwarded on to Washington for processing.

Generally, an AA1 rating will be assigned for maintenance and repair materials and an AA2X rating for the purchase of capital-investment materials, these ratings having been satisfactory as far as tubular goods are concerned, although not high enough to secure engines and motors. Any uprating or other procedure necessary to secure those and similar items will be worked out by the materials division.

National Emergency Specifications for Steel Products

(Part 3102)

OIL COUNTRY TUBULAR GOODS

§ 3102.10. **Schedule 9 to Limitation Order L-211—(a) Purpose and scope.** This schedule prescribes certain standards for the manufacture of oil country tubular goods, as herein defined. The schedule does not relate to use; oil country tubular goods made in accordance with this schedule may be used for any purpose, and other types of tubular material may be used in oil and gas wells, in each case subject to any restrictions contained in other orders of the War Production Board or the Petroleum Administration for War.

(b) **Definition.** "Oil country tubular goods" means oil well casing, tubing and drill pipe.

(c) **Restrictions on sizes and specifications.** No person shall produce, fabricate or deliver oil country tubular goods except as set forth in American Petroleum Institute Specification for Casing, Drill Pipe and Tubing, API Standard No. 5-A, dated May 1942, and Supplement No. 1 thereto, dated December 1942, or in List 1 attached hereto. However the use of Bessemer or open-hearth steel in the manufacture of casing and tubing shall be optional with the manufacturer and no purchaser may specify the type of steel to be used on his order.

(d) **Acceptance of delivery.** No person shall accept delivery of any oil country tubular goods which he knows or has reason to believe were produced, fabricated or delivered in violation of the provisions of paragraph (c).

(e) **Exceptions.** (1) The provisions of paragraphs (c) and (d) shall not apply to any oil country tubular goods:

(i) The production, fabrication, delivery or acceptance of which is specifically authorized in writing by the War Production Board, or

(ii) For which an order was entered prior to April 30, 1943, provided shipment of the entire order is made on or before June 30, 1943, or

(iii) Oil well casing produced by electric fusion welding.

(2) The provisions of paragraph (c) shall not prohibit:

(i) Waiver by the purchaser of any of the inspection or test requirements of the specifications prescribed in paragraph (c), or

(ii) Delivery or acceptance of any oil country tubular goods which because of errors in manufacture do not conform to the requirements of paragraph (c), providing such requirements are waived by the purchaser or procuring agency, or

(iii) The production, fabrication, delivery, or acceptance of lap-weld tubing or lap-weld casing with V type thread, or

(iv) The production, fabrication, delivery, or acceptance of any oil country tubular goods having thread dimensions or types of joints other than those prescribed in paragraph (c), provided the purchaser endorses on the purchase order a statement signed by an authorized official, either manually or as provided in Priorities Regulation No. 7, substantially as follows:

The special threads or special types of joints specified in this order are necessary to the successful installation and operation of the pipe covered by said order, and none of the standard thread dimensions or types of joints specified in Schedule 9 to Limitation Order L-211 issued by the War Production Board, will meet the service requirements to which said pipe is to be applied.

Name of Purchaser	Signature of Authorized Official	Title

Such statement shall constitute a representation to the seller and to the War Production Board, and may be relied on by the seller unless he knows or has reason to believe it to be false.

(f) **Records.** Each person owning or possessing oil country tubular goods excepted by the provisions of paragraph (e) shall retain records of such material available for inspection by duly authorized representatives of the War Production Board.

Issued this 30th day of April 1943.

WAR PRODUCTION BOARD,
By J. Joseph Whelan,
Recording Secretary.

LIST 1

Additional Permissible Sizes of Lap-Weld Casing and Tubing

Lap-Weld Casing

Size Outside Diameter, Inches	Wall Thickness, Inches	Nominal Weight per Foot, Lbs.
5½	.304	17.00
6⅝	.185	13.00
7	.272	20.00
8⅝	.304	28.00
10¾	.307	35.75

Standard Lap-Weld Tubing (Non-Upset)

Size Nominal	Outside Diameter, Inches	Wall Thickness, Inches	Nominal Weight per Foot, Lbs.
2	2.375	.167	4.00
3	3.500	.216	7.70
4	4.500	.237	11.00

The above sizes apply only to short thread casing and to standard non-upset tubing. In all respects other than outside diameter, wall thickness, weight per foot, and threading practice, such casing and tubing shall conform to the requirements of American Petroleum Institute Specification for Casing, Drill Pipe and Tubing, API Standard No. 5-A, dated May 1942, and Supplement No. 1 thereto, dated December 1942.

Most Mud Lab Items Not Effected by Priority Ruling

Application to the oil industry of WPB Order L-144, dealing with laboratory equipment, will not cover equipment designed primarily for mud testing except in the case of three instruments, it is held in an interpretation prepared for the guidance of operators by PAW.

The order imposes restrictions upon the transfer, delivery and acquisition of new laboratory equipment and supplies, not including reagent chemicals, which contain any aluminum, chromium, copper, iron, magnesium, molybdenum, nickel, steel, tantalum, tin, titanium, any alloy of those metals; rubber, neoprene or other synthetic rubber, or non-cellulose-base synthetic plastics.

The order expressly permits the use of the laboratory equipment covered only for research on, or production, analysis or testing of materials; research for the Army, Navy, Maritime Commission or any other government department or any Lend-Lease government; or as repair parts and operating supplies for the maintenance of existing essential equipment and activities in laboratories, but an operator may apply for authority to put laboratory equipment of this type to any other use which is necessary and appropriate in the public interest.

An item or quantity of the same item of the laboratory equipment covered, with a value of less than $50, may be acquired by an operator in the normal course of his operations and without the need for any specific authority but an item or quantity of the same item, with a value of $50 or more, may be acquired only through specific authorization from WPB.

WPB officials, it was explained, have stated that the order applies only to material and equipment designed primarily for laboratory use and, therefore, equipment designed primarily for mud testing is not subject to its restrictions.

It was pointed out that the requirements of the order that authority be obtained to acquire or use laboratory equipment are distinct from the steps necessary to obtain priorities assistance under Order P-98-b.

Reserve Oil Stock to Fill Government's Eastern Needs

Establishment of a "kitty" on the East Coast to assure full delivery of federal government non-military contracts has been ordered by PAW to protect suppliers who obtain government orders.

The purpose of the pool was to assure the delivery of all government requirements and to offer both primary and secondary suppliers the opportunity to bid on such contracts.

Under the plan, when the procurement division of the Treasury asks for competitive bids on requirements of gasoline and principal petroleum products each quarter, PAW will arrange with the East Coast supply and distribution committee for a "kitty" of the full amount, from which the successful bidders will withdraw the oil required under the contracts, without affecting the allotment given them for their regular civilian business.

PIWC Continues Fight for Crude Price Increase; Economics Report "Military"

Repection by OPA of proposals for a general increase in crude prices was the major subject of discussion at the May meeting of PIWC, members of which were represented as "disgusted" with Administrator Brown's attitude but determined to continue their fight.

The council authorized the committee on cost and price adjustment to continue to pursue the matter, compiling data on which to base an answer to Brown's letter to Ickes, and, for that particular activity, voted to increase the membership of the committee by five producers.

The tubular goods situation also came up for discussion, and a resolution was adopted recommending that PAW take such steps as are necessary to insure the scheduling and delivery of the carbon steel which will be needed to drill the wildcats programmed for this year.

An exhaustive review of the situation showed that shipments of new tubular goods from mills during the 12 months ended last March were approximately only 120,000 tons as compared with an estimated consumption of over 1,000,000 tons.

To drill the 16,000 wells asked for by PAW this year, approximately 965,000 tons of carbon steel will be required, or approximately 240,000 tons per quarter, whereas during the first quarter only 77,000 tons of new pipe actually were delivered to the field. During that period orders for 32,000 additional tons were placed with the mills but not delivered and carried over to the current quarter, thereby reducing the allotment by that amount.

Tubular Situation Critical

As a result of the inability to secure tubular goods, steel is being taken from inventories, which now are unbalanced and contain much material of odd-and-end sizes, grades and weights; in many instances stocks have been completely depleted or will be before additions can be made.

"This has resulted in a critical condition in the tubular goods situation for the second quarter of 1943, which has been aggravated by the fact that 50,000 tons of lend-lease pipe has been deducted from the production division's second quarter allotment on the premise that such lend-lease material is immediately usable," the resolution stated. "The nature of this lend-lease material is such that it cannot be readily absorbed in any quarter. This material was designed for foreign use and contains sizes, weights and grades not readily adapted to domestic use."

The minimum drilling program for the third quarter has been set at 4322 wells, which will require the use of 266,000 tons of carbon steel, it was declared.

Lack of estimates of future military requirements continue to make impossible any forecast of future supply and demand or planning of industry operations, the council was told in the monthly report of its petroleum economics committee.

In a brief report, largely devoted to discussion of military matters which would not be made public, the committee disclosed that increased military demand and failure of deliveries to the East Coast to come within 75,000 barrels a day of the April anticipations combined to keep stocks at a critical level—lower than previously forecast and too low for efficient operation.

As a result, Chairman Robert E. Wilson declared, civilian consumption for the present must be kept down to the minimum level possible without disruption of essential civilian and industrial activities, in order to make available the maximum supply for military use and build up working stocks to efficient operating levels.

Need More Crude

However, he added, stocks will begin to build up and larger supplies will be available for military use this month and next, as a result of the close of the heating season and resultant decline in civilian demand for fuel oil.

Although no estimates of future production or demand were submitted by the committee, it repeated its warning that greatly increased crude production will be required by the end of the year, and endorsed the PAW recommendation for a price increase which, almost at the moment, was denied by OPA, as a practical means of bringing such an increase about.

PIWC adopted a resolution asking PAW to initiate discussions with the rubber industry and other government agencies for the purpose of developing a joint cooperative plan for the securing of the personnel necessary to operate the new synthetic-rubber plants as they come into operation, so as to avoid interference and undue competition between the refineries, rubber plants and other activities which all require the same types of skilled workers.

In another resolution, PAW was asked to work out with the Internal Revenue Bureau an amendment to the internal revenue code to allow the writing off of the cost of conversions from oil to other fuels between the time of conversion and the end of the war. Such a provision would aid large industrial establishments which have converted, and would be in line with previous action of the bureau providing for quick amortization of the cost of tank trucks.

A new committee on the renegotiation of war contracts was set up by Chairman William R. Boyd, Jr., with W. S. S. Rodgers, president of The Texas Company, as chairman, and including in its membership John A. Brown, president of Socony-Vacuum Oil Company; H. D. Collier, president of Standard Oil Company of California; Ralph W. Gallagher, president of Standard Oil Company of New Jersey; Charles S. Jones, president of Richfield Oil Company (California); E. G. Seubert, president of Standard Oil Company of Indiana, and R. Van Der Woude, president of Shell Union Oil Corporation.

At the pre-council meeting of the production committee, figures on drilling operations indicated that the downward trend that prevailed from July, 1942, through February of this year has been at least temporarily reversed but at the end of March was far from the level required to carry out the PAW drilling program.

It was also disclosed that during the past month the special study committee of technical advisers has prepared reports on the possibilities of using transit pipe as a substitute for well casing, the elimination or simplification of casing strings used in drilling, and reduction of the amount of steel used in oil-well-pumping units.

The meeting received the resignation of O. D. Donnell as chairman of the production committee, due to his appointment as general chairman for District 2, and directed the appointment of a committee consisting of George A. Hill, Jr., John M. Lovejoy and J. C. Hunter to prepare appropriate resolutions of appreciation of his service.

Brown Refuses Crude Price Increase; Offers Plan to Subsidise Wildcats

Taking refuge behind President Roosevelt's "hold the line" order of April 8, OPA Administrator Brown disclosed May 4 that he had rejected PAW's recommendation for a general increase in crude-oil prices but had countered with a proposal for government loans for wildcats, with advances sunk in dry holes to be written off.

At the same time, Brown called upon Ickes to reform practices which prevented the full development of proven properties and proposed that relief be given in all individual cases where necessary to protect stripper wells from abandonment or encourage secondary-recovery operations.

These proposals were contained in a "determination, after thorough consideration of all factors involved," as follows:

"1. That the general average increase of crude-oil price ceilings as proposed should not be granted.

"2. That specific relief may be given to producers where stripper or repressure operations make present production unprofitable.

"3. That increased incentives may be extended to promote exploration for oil.

"4. That full development of proven properties should be insured through other necessary action under existing powers."

In a lengthy defense of his position, Brown told Ickes that "while historically it is generally true under normal conditions that drilling rates have increased

and declined with fluctuations in business activity and prices, and while it is obvious that a higher price tends to encourage 'wildcat activity,' it is my opinion that price is not the most important factor in this situation at the present time.

"Consequently," Brown added, "I do not believe that price should be used to correct conditions for which it is not the basic cause, nor in a situation in which its possible effects are so nebulous and indirect as to remain purely conjectural. In time of war there are more direct means by which positive results can and should be accomplished."

The factors other than price which Brown found to be involved in the problem include manpower, spacing restrictions, restrictive allowables in prorated states, difficulty in procurement of materials, transportation difficulties, etc., and, he went on, "although general limitations have not been placed on the use of steel in wildcat operations, still the delays in securing replacement parts and equipment are a deterring factor.

"I believe more can be gained by correcting these conditions than can be accomplished through price action," he declared.

Referring specifically to the argument that higher price will make funds available for exploration work, the OPA head insisted that while this is true so far as companies already owning production are concerned it offers no assistance to the wildcatter without such production.

However, he assured Ickes, "it is not my intention that any prospective exploratory well which your office thinks should be drilled should remain undrilled because funds are not available with which to drill it.

"Without Interference"

"With this in mind, my staff has been working on a plan to meet this need. The plan will make funds available to the 'wildcatter' by a method in general use in the industry and without governmental interference in his operations.

"In my opinion," Brown explained, "one of the most economic and effective means of stimulating wildcat operations and of assuring funds for the use of the operator is through government participation in financing the proposed well. Under the plan considered and proposed, if the historical ratio of producers to dry holes obtains, there would be no out-of-pocket expense to the government; if the ratio is less favorable, the plan would still cost the government but a fraction of the amount the public would pay under a general crude-oil price increase. The recommended increase in the price of crude oil would amount to an annual excess cost of approximately $500,000,000 based on present production. The total governmental outlay for drilling 4500 wildcat wells at an admittedly high average of $50,000 per well would be less than $150,000,000 even if every well so drilled was on an oil payment basis. The recovery of such outlay based on hsitorical ratio figures of producers to dry holes should make such an exploratory program nominal in cost if not self-sustaining."

Under Brown's plan, the government would furnish capital through existing banking facilities to operators for wildcat operations, and in return for its investment would receive a one-fourth override interest in any well proving to be a commercial venture. If the well proved to be a dry hole the override interest would be worthless and any obligation in connection with funds so advanced discharged; in the case of a producing well, the operator would have the option of permitting the one-fourth override to stand or of liquidating such interest on the basis of $7 for every $1 advanced.

Amount Advanced

The amount advanced under the plan would be limited to a maximum of two thirds of the estimated actual cost of drilling the well, subject to revision upwards or downwards when final figures were available, with the balance of the cost to be handled by the operator through the sale of acreage, bottom- or dry-hole money and/or personal assets.

Under this plan, Brown explained, duly qualified operators "could and would" undertake wildcat drilling to any degree deemed necessary or advisable and "in contrast to a general price increase all funds made available would be used directly in exploring for new reserves." In case the well proved to be a producer and additional funds were required for completion, the money would be available on a dollar-for-dollar repayment basis. While some administration would be necessary, he contended, "it is not contemplated that it would be more involved than that customarily present in comparable business transactions."

"The original idea for this plan was advanced by an oil producer and we have received favorable reactions in discussing it with both large and small operators," the administrator said. "It in no way provides for government participation in the management or ownership of the oil industry."

Brown also agreed that the problem of secondary-recovery and stripper-well production is serious but refused to admit that a general price increase was a proper method for dealing with it as "at most, not more than 15 percent of the total volume of current production is in this category, and since it is not conceivable that all of this could presently be on the verge of abandonment, the percentage demanding immediate attention is much less.

"While there are approximately 300,000 stripper wells producing at the present time, it appears that less than 3-1/3 percent were abandoned last year," he asserted. "If a price increase of 35 cents per barrel is the amount necessary to prevent undue abandonments at this time, it is evident that if it can be restricted to wells which would be abandoned under existing conditions, the cost will be about 0.5 percent of that resulting from a general price increase. Certainly a plan capable of achieving the ends desired and reflecting such a saving in over-all outlay can be formulated.

"Prospective secondary-recovery projects in areas where existing prices make them uneconomic will be considered on the same basis. You are no doubt aware that it has been our policy for some time to make such necessary price adjustments in cases where the crude-oil producer is able and willing to absorb the increase. It is my thought that situations where the purchaser cannot absorb an increase in crude prices can be handled by an obvious variation of the oil-payment plan."

As to increased costs of production which have already occurred and those which will be experienced as a result of the 48-hour week, Brown said, OPA studies do indicate that some increase in costs has occurred since 1941 but the average margin between net cost and price of oil in the second quarter of 1942 was in excess of the corresponding amount in 1939 and 1940 and, accordingly, the increased costs could not be used as a justification for a price increase.

"I have endeavored to discuss the issues raised by your letter of April 7 on their merits and without reference to the legal limitations imposed upon this office," he concluded. "You do, of course, recognize that the Act of October 2, 1942, and the Executive Order of April 8, 1943, require this office to use all discretionary powers vested in it by law to prevent further price increases, and that the only increases that could be made effective were increases required by law. Although I do not feel that this is the place to discuss all of the implications of this order, I am not of the opinion that such an increase could be justified thereunder."

Brown's decision met with sharp dissatisfaction at the Capitol, where Representative Wright D. Patman of Texas, chairman of the little-business committee which was the last to investigate the price situation, predicting that OPA would be over-ruled either by Stabilization Director James F. Byrnes or by Congress.

Patman indicated that he would introduce legislation for a price increase if Byrnes did not act, declaring that the OPA head had made a "serious mistake."

"We will soon find ourselves with plenty of tires but without gasoline," he said. "This not only will stop our civilian economy, but will greatly jeopardize our war effort. I deplore that more vision was not used in this decision. The handwriting on the wall is very plain and there is undisputed evidence to support a rise much more than Mr. Ickes recommended."

Representative Lyle Boren of Oklahoma also criticized the decision, declaring that Congress should not "tolerate" subsidies. A year ago, Congress definitely refused funds for subsidy payments, in which category Boren saw the loans for wildcatting suggested by Brown, which would be canceled in the event hole turned out to be dry.

There was also criticism on the Senate side, where a resolution was introduced April 26 by Senator Elmer Thomas of Oklahoma, calling for a price of $1.95 for crude.

OPA Takes Over Liquid Gas Department

Transfer of the WPB liquefied petroleum gas section to PAW, where it was made a branch of the division of natural gas and natural gasoline without change in personnel, was announced by Administrator Ickes May 3.

The section is headed by Paul K. Thompson, who was in charge of the

distribution of butane, propane and their mixtures for WPB.

The principal function of the section is administration of Limitation Order L-86, regulating the installation of liquefied petroleum gas equipment, and requests for exceptions to that order and other matters relating to it are in future to be submitted to PAW instead of WPB.

The transfer, arranged by WPB Chairman Donald M. Nelson and Deputy Administrator Ralph K. Davies, is designed to facilitate the regulation of further expansion of the use of liquefied petroleum gases necessitated by a sharp increase in consumption and difficulties of transportation to consuming areas.

A. A. Jergins Heads Facility Security Division of PAW

Resignation of William D. Mason, Sun Oil Company, Philadelphia, as director of PAW's facility security division, and appointment of Allen A. Jergins, vice president of the Jergins Oil Company, Long Beach, Cal., as his successor was announced by PAW May 4.

Mason's resignation was submitted when the period for which he had agreed to serve, to get the facility security division under way, expired and was accepted by Ickes because of that fact and Mason's desire to return to his company.

Jergins has had 17 years experience in the industry, with the company of which he is an officer. He also is vice president of the San Joaquin Valley Oil Producers Association, vice chairman of the Oil Industry Protection Committee of California, a member of the western region committee of the PIWC committee on protection of petroleum facilities, president of the Monterey Exploration Company and a director of Lomita Gasoline Company.

The facility security division is responsible for the development of fire prevention and protective measures, prevention of exposure hazards, safety measures to eliminate plant hazards, precautionary measures against sabotage and an engineering service for uniform safety measures at all plants. The work is integrated with the Army, Navy and Office of Civilian Defense.

New England Fuel Oil Delivered as Promised

Six months' sales of heating oil and kerosine by the 13 original supplying companies operating in New England were but 0.7 percent short of the 75 percent of normal requirements which PAW promised, it is claimed.

Figures compiled by PAW placed sales from October through March at 21,490,697 barrels, compared with 27,300,978 barrels in the preceding year and 28,929,513 barrels which it was estimated would be normal last winter in view of the colder weather.

It was admitted, however, that while sales averaged 74.3 percent of the estimatd normal, they varied greatly from month to month, running as high as 82.1 percent in December and as low as 68.3 percent two months later.

Gasoline-Rubber Priorities Hearing Finally Passes Buck to Nelson

Censuring all officials concerned in the controversy over priorities for synthetic rubber, the Truman committee on May 6 asserted that "heads must be knocked together" and "basic weaknesses" in the control of the war effort eliminated.

In a special report summing up its hearings at which Ickes, Patterson, Jeffers and Nelson each gave their version of the rubber-aviation gasoline fight, the committee assailed the issuance of executive orders setting up semi-autonomous agencies dealing with only specific parts of the war effort.

Nelson was criticized for failure to exercise his authority to settle disputes and, the committee declared, "the strong over-all authority of the War Production Board must be made a living reality."

The committee found it natural that "energetic, aggressive men, striving to meet war needs, will tend to clash when their duties bring them into conflict," but warned that a further controversy of this type "might seriously impair the effectiveness of able leaders."

"The issues in this dispute, involving war strategy, can and should be resolved by the agency established for that purpose—the War Production Board," the committee said. "This report is directed not at these issues, but at the weaknesses in administration of the war effor which permits such disputes to reach the point of public controversy."

Such weaknesses were believed to have been eliminated by creation of WPB in January, 1942, the report pointed out, but confusion in authority was created by subsequent orders establishing the Office of Rubber Director and PAW, with Nelson's authority over both "only tenuous" at best.

Officials in charge of each major program should meet and discuss their problems together regularly and frequently, the committee held.

"Each must be made to feel a great sense of responsibility for the entire program with no diminution of his responsibility for that part under his control," it added.

It was significant, the report commented, that the contest between rubber and aviation-gasoline proved too hot for WPB to handle and finally was appealed to the White House.

Army and Navy officials were accused of failure to anticipate "by a wide margin" the wartime needs for aviation-gasoline.

The Truman Committee investigation of the priorities squabble between PAW, the War and Navy Departments, the Rubber Director and WPB wound up last week with WPB Headman Donald M. Nelson definitely on the spot.

Bracketed by the cross-fire of PAW Ickes and Rubber Czar Jeffers, Nelson was charged by the former with having failed to realize the necessity of gasoline to keep our planes in the air and by the latter with having failed to provide the most competent direction of the materials program.

The one concrete accomplishment of the probe was to bring Jeffers and Undersecretary of War Patterson together, the latter telling the committee that "Jeff" was doing a fine job and that the two were going to tour the country's plants to "break bottlenecks."

Patterson, however, refused to recede from his charge that the lack of 100-octane gasoline was resulting in grounded planes, although he explained that the idle machines were training planes in this country and not fighters in the theatres of war. Between training in the regular training planes using 91-octane fuel and their assignment to war planes in actual service, he explained, fliers should get experience in combat planes which they will fly; such planes use 100-octane and since supplies are short this transitional training has had to be foregone.

Ickes, earlier, had contended that all requirements of the Army and Navy were being met. Patterson, however, declared there was a shortage of 30,000 barrels daily last month and 44,000 barrels expectedly this month.

Matter of Transportation

Patterson also lashed out at Nelson, who had declared the grounding of planes for operational training was the result of faulty distribution rather than of over-all shortage, declaring that it was essential that large reserves be built up at overseas bases because of the length of time and hazards of transportation. Nelson's showing that consumption in February and March was less than production meant nothing, he said, because of the time factor; gasoline produced in February should be compared to domestic consumption in March and overseas consumption in May.

Current requirements are more than 50 times the consumption three years ago, and requirements for the future will be more than double those of today, he said.

"Most of the 100-octane gasoline to fill those requirements must come from American refineries," he told the committee. "The petroleum industry has made an excellent record in responding to the needs, considering the rapidly mounting demands made on it and the difficulties encountered in obtaining the equipment necessary for altering plants and building new plants.

"The main facts are, first, that our requirements are not being met today and, second, that we do not as yet have the production recommended by the War Department in February, 1942, over 14 months ago," he declared.

"The synthetic rubber program is an important program. I do not believe, however, that today it is as urgent a program for war purposes as the 100-octane-gasoline program."

Admitting that "more competent direction would have been helpful," Jeffers asserted that the expanded rubber program for which he was given a directive last December would result in

the production of more, rather than less, aviation gasoline.

Jeffers was critical of both WPB and OPA, charging that "OPA and others seem to delight in having it so arranged that they can in some manner restrict the people."

Making no effort to hide his dislike of Washington, he told the committee he was anxious to finish up his job and get back to his railroad, and refused to respond to a suggestion by Senator Mead of New York that he might take over the aviation-gasoline program while Ickes was tied up with the coal situation.

Jeffers declared that charges that preferences granted rubber had seriously interfered with gasoline production indicated he and his associates "have done our job well—perhaps even too well."

"The testimony has brought out that the forced progress of the synthetic-rubber campaign has not delayed the manufacture of 100-octane gasoline or escort vessels or aircraft or merchant marine," he asserted. "Rather the momentum of the rubber program has dragged forward all of these phases of the war."

Under questioning Jeffers said rubber consumption has been under the estimates of several months ago because of conservation measures taken by the Army and other large users. However, he said, the program has not yet passed the critical point.

Not Too Much Rubber

Production of synthetic rubber this year will amount to 275,000 tons, but the reserve at the end of the year will be only 145,000 tons of all first-grade rubber. Referring to press statements that there might be "too much" rubber, he declared that "I do not think there will be too much rubber if there is enough for military needs, for essential civilian driving and enough left over to permit the American people to go about at least some of their normal activities."

Within three or four months, the director said, there will be a surplus of the plant machinery for which the rubber, gasoline and other programs are now fighting.

Answering charges made by Ickes when he appeared before the committee, Jeffers said the administrator had overlooked the following factors:

1. "The demands we made in following the Baruch report insisting that the rubber program be given higher priorities played a large part in the reorganization of WPB and has brought about the present scheduling procedure directed by Vice Chairmen Charles E. Wilson and Ralph Cordiner, which is benefiting all programs.

2. "The Secretary of the Interior claims that he lost 4,000,000 barrels of high-octane gasoline. Had he taken into account the additional production that was brought about because of our activities and because of his share of the directive, he would have found that he gained, or at least suffered no loss.

3. "The by-products made by the butadiene plan of the rubber program which were given the first directives will provide constituents for more than 20,000 barrels per day of high octane, and a plant being built without directives will make a still further contribution to the high-octane program."

War Takes Oil—And a Lot of It

A mechanized division burns 18,000 gallons of gasoline an hour when proceeding at normal speed; a heavy bomber at cruising speed uses 200 gallons an hour and a fighter plane half that much, according to Army figures quoted by the Office of War Information.

Eighty times as much oil and products was shipped overseas during the first 12 months of this war as was shipped in the first year of what once was called the World War. A round trip to Casablanca in itself calls for some 214,000 gallons of heavy fuel oil, OWI said.

With terrific quantities of oil required to be moved in operations such as those in Africa, the Army, it was announced, has developed portable pipe lines to supply units in the field.

Built in self-contained half-pint units, complete with a centrifugal pump driven by a 20-horse power gasoline engine, these lines can be moved by cargo truck, alone or in combination, it was said. These self-contained sections are able to deliver gasoline over any terrain at a rate of approximately 200 gallons a minute, and can be used also to assist or even replace floating gasoline tanks for ship-to-shore operations.

Pleasure Driving Control To Be Tightened

Acknowledging the failure of the "honor system" to control pleasure driving, OPA Administrator Brown on May 5 initiated a nation-wide campaign to round up motorists using B and C rations for other than essential driving and to stamp out black markets.

Brown declared that gasoline supplies on the East Coast are shorter now than at any time since the war began, while in other areas mileage rationing continues essential if rubber supplies are to see us through.

There will be none of the "snooping" which was complained of before he instituted the honor system some weeks ago, but police will be asked to question motorists stopped for violations as to the essentiality of their driving and to report cars seen at resorts and recreation spots.

A report by the Public Roads Administration showed that traffic on rural roads in March was off 48 percent from 1941 volume in the Eastern shortage area and about 37 percent in the remainder of the country, but at that time pleasure driving was still under sharp restrictions.

PRA reported also that gasoline-tax collections in 29 states totaled $23,621,000 in March, a drop of 27.8 percent from the same month in 1941. The decline averaged 40.3 percent for the 9 East Coast states included in the compilation and 21.7 percent for the 20 other states.

ODT also moved to conserve oil equipment during the week, on May 5, ordering the streamlining of services of tank trucks engaged in local deliveries.

The order prescribed minimum quantities for motor-fuel deliveries to retail outlets and to farms and other ultimate consumers. Other provisions curtail callbacks and immediate service, require less-than-truckload deliveries to be grouped in full loads and call for economical routing.

A report to PAW announced that between 28,000 and 30,000 barrels of gasoline daily will be moving through the trans-Florida pipe line by the end of this month as tow and barge facilities on both ends of the line are coordinated.

Relief Agencies Get Rubber Drive "Profit"

Four checks, each for $608,296.30, were turned over to the American Red Cross, Army Emergency Relief, Navy Relief Society and United Service Organizations May 5 by William R. Boyd, Jr., chairman of PIWC, as the result of the oil industry's rubber drive last summer.

The checks were presented to James F. Byrnes, director of economic stabilization, at a luncheon given by the council. Byrnes, in turn, passed them on to the Red Cross Chairman Norman H. Davis, Undersecretary of War Robert P. Patterson, Admiral Ernest J. King and USO President Chester I. Barnard.

The $2,433,185.20—representing the "profit" derived by the industry from the purchase of scrap rubber at 1 cent per pound and its resale to the Rubber Reserve Company at 1¼ cents—covered the proceeds from 452,000 tons of rubber collected through the filling stations of the country, with an additional sum yet to be recovered from 2000 tons remaining of the 454,000 tons collected and other small amounts expected when final reports are made. Not included in the checks turned over were the proceeds from sales of several hundred companies who turned the money over directly to local branches of the four relief organizations.

The money actually turned over to the organizations represented less than half of the industry's real contribution, which included the out-of-pocket expenses of running the drive and the time spent in collecting, sorting, packing and shipping the rubber, etc., estimated to amount to several million dollars.

The luncheon was in the nature of a celebration of the successful termination of one of the most ambitious undertakings ever attempted by an industry as a unit. Addresses, which were broadcast nationally, were made by Byrnes, Administrator Ickes, Secretary of Commerce Jones, and WPB Chairman Nelson.

Flowmeter Makers Meeting Demands

The breaking of one serious bottleneck in the production of synthetic rubber and aviation gasoline was disclosed last week at a meeting of the Differential Flowmeters Industry Advisory Committee with WPB officials.

The situation with respect to differential type flowmeters, officials said, has so far eased that there is no need for WPB to screen purchase orders, although they continue to be a critical product.

Manufacturers reported that the industry is not meeting with any difficulty in making deliveries, since current orders by all of the claimants call for delivery dates so far in advance that they can be fitted easily into schedules.

"Get the Oil Where You Know It Is" Advice to AIME at Dallas

By ELTON STERRETT, Staff Writer

THE best means of relieving the alarming decline in daily productive capacity and thus procuring the oil so direly needed lies in the advancement of secondary recovery methods and in prospecting present producing structural traps for deeper horizons, members of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers were told at their spring meeting in Dallas last week.

Presently known fields after all primary recovery is made will still have about 70 billion barrels of oil left in the ground, and it is the engineers' problem to get as much of this oil as economically possible, asserted D. R. Knowlton, director of production for the Petroleum Administration for War.

Adopt a program of "drilling 'em deeper," urged A. R. Denison of Amerada Petroleum Corporation and newly elected president of the American Association of Petroleum Geologists, who said there is a vertical mile or more of sediments underlying many hundreds of square miles of structural traps and that deeper drilling on known structural features would eliminate the greatest hazard in wildcat drilling—the absence of a suitable trap under the site.

Study of well fluids and further intensification of efforts to obtain a complete picture of reservoir and well conditions characterized the meeting's technical papers, with actual production or well-flowing problems coming in for secondary emphasis. Recognition of the growing need for disposition of water produced with the oil was accorded this phase of production through a discussion of the effect of bacteria in sealing off the return formation and through a review of progress made on East Texas field's salt-water-disposal system. An outline of optimum pumping conditions, followed by a discussion of pressure behavior in flowing oil wells, covered the subject of production from the standpoint of oil produced, while the effect of water on the stability of gasoline motor fuels presented one phase of the storage problem now rendered more acute by inability to ship fuels as rapidly as they are produced.

Abstracts of papers follow:

A Challenge to Petroleum Engineers

By D. R. KNOWLTON, *director of production, Petroleum Administration for War*

The most economical, and consequently the best, source of additional oil for our war program, aside from exploratory drilling, lies in secondary recovery. This is a challenge to the petroleum engineers. Some quick calculations reveal the magnitude of this possibility. Since Drake's first well up to the present we have produced about 27 billion barrels of oil from all the fields that have been discovered. Adding the 20 billion barrels of known reserves today, total oil that has been found amounts to approximately 47 billion barrels. If we assume the recovery factor to be 40 percent, then the oil to be left in the ground from presently known fields after all primary recovery will be about 70 billion barrels. It is the engineers' problem to get as much of that oil as economically possible.

Two variables determine how much of these billions of barrels of oil will be produced eventually—price and engineering. Price is important, but in the final analysis, even if crude oil were selling for ten dollars a barrel, it would still be the job of the engineer to devise the techniques to get the oil on top of the ground.

We have learned a lot about secondary recovery during the past few years, but we have only scratched the surface. Bradford was a natural textbook example which will not be duplicated very many times, if ever. Future secondary recovery is going to be difficult. There will be perplexing problems which must be solved. There will be mistakes, false starts, and failures. More experimental projects should be inaugurated in order to determine results under varying reservoir conditions.

The same thoughts and statements apply equally to pressure maintenance and to other forms of reservoir control which increase ultimate recovery of oil.

This oil that may be recovered after primary recovery has taken place will be the result of engineering and should be called "engineers' oil." My challenge to you is to get more of this "engineers' oil."

The day is not far off when it will be sorely needed. The producing branch of the industry is passing through an era of plenty and inflated potentials into an era of scarcity and unmet allowables. Today every oil producing area in the United States except the Texas Gulf Coast and West Texas is producing close to or in excess of its maximum efficient rate.

At a recent meeting of producers in Tulsa, every Kansas operator present insisted that state was producing in excess of its efficient rate to the detriment of ultimate recovery. PAW will exercise extreme caution in establishing Kansas quotas so as to avoid damaging the fields of that state through excessive rates of production. The same situation applies elsewhere. Even the great East Texas field is producing at a rate which is uncomfortably high, although a very constructive water injection program now under way will partly alleviate this situation.

Unless our record of discoveries is substantially better during the next few years than it has been during the last few, our domestically produced oil will be insufficient to meet our demands. If our exploratory effort is inadequate, how can our supply be supplemented unless we produce larger quantities from fields already discovered?

Review of Exploration and Exploitation Practice

By A. R. DENISON, *president, American Association of Petroleum Geologists*

The quickest relief from our alarming decline in daily productive capacity may lie in abandoning any remaining preconceived ideas of "farewell horizons" and doubts as to lack of source rock or porous horizons and adopt the philosophy of "Drill 'em deeper."

Through a brief examination of a few areas in the Mid-Continent it was demonstrated that there is a vertical mile or more of sediments underlying in the aggregate many hundreds of square miles of structural traps. Thus literally hundreds of cubic miles of sediments on our choicest structural features await the drill. In many cases the amount of such sediments remaining is much greater than the amount already exploited.

These are areas where there is no need for geological or geophysical effort since such work has already been done by the wells drilled thus far. A great many of them will require a well to less than 10,000 feet and none over 15,000 feet. They all have the great advantage in these times of materials shortages of having pipe line and transportation facilities already available.

Greater application of geology and geophysics in order to find the much needed new oil fields was called for by Frank Goldstone and A. I. Levorsen in papers presented a month ago at the annual meeting of the American Association of Petroleum Geologists. They advocated both a wider and more intensive application on a higher scientific plane of these two proven successful methods of exploration. Neither of them foresaw in the immediate future assistance from any new powerful finding tool, but were confident that with proper application geology and geophysics would find the oil fields necessary to maintain and increase reserves. These papers were quoted from at considerable length by the speaker, who then turned to a discussion of the opportunity for finding oil by drilling deeper on known structural traps which are now producing oil.

The exploratory wildcat is drilled primarily in search of a trap and the reason for failure to find oil and gas in nine out of ten cases is due to the absence of a suitable trap under the site. Deeper drilling on a known structural feature which is productive, therefore, largely eliminates the greatest hazard in wildcat drilling.

Only to a limited degree is the antiquated assumption true that any given sedimentary horizon marks the end of possible oil accumulation. It may be true that better-known and outstanding structural traps have been thoroughly exploited. For many years in the early history of prospecting in Oklahoma the top of the Mississippi lime was considered the "farewell" horizon. This

was entirely eliminated by discovery of oil in the Wilcox sand. Other similar examples which limited prospecting could be recited for nearly every oil province. The thesis in this discussion is the premise that no structural trap be condemned for deeper production until all sedimentary beds above granite or other basement rocks are drilled. At this point the speaker showed several slides to illustrate that there remain not a few hundred feet but rather thousands of feet, in most cases more than a mile in thickness, and in some cases more than two vertical miles of additional sedimentary beds which await the drill below present prospected levels in several areas.

Effect of Certain Micro-Organisms On Injection of Water Into Sand

By F. B. Plummer, E. E. Merkt, Jr., H. H. Power, H. J. Sawin and P. Tapp, *University of Texas*

This paper describes briefly some of the common micro-organisms which occur in waters obtained from tanks in the Luling and East Texas oil fields, discusses in some detail the effect of these organisms on the chemical content of the waters, describes the bio-products and precipitates resulting from growth of bacteria and algae and illustrates by experiments the effect of these organisms and their precipitates on the permeability of oil sands into which contaminated water is introduced. Experiments and discussion are planned with special reference to water-flooding and water-disposal problems.

Four types of organisms are found to be present in oil-field waters which appear to play a principal part in producing harmful precipitates; iron bacteria, sulphur bacteria, sulphate reducing bacteria, and blue-green algae. Only the last is visible to the eye. The types of reactions taking place with each of the bacteria are discussed, and the nature of the resulting materials studied with reference to clogging qualities.

The various organisms were tested experimentally with a "well" consisting of a small core of limestone through which a hole had been cut to permit introduction of liquids. Checked first with distilled water and permeability rate thus established, 5 gallons of Fe-bearing water was then passed through the core and permeability again determined with distilled water. A maximum loss of 79.7 percent permeability was thus determined.

The experimental "well" was then flushed with HCl to remove the thick coating of $Fe(OH)_3$ covering the interior of the core, the excess sucked out, and the well washed with water, after which permeability was again determined. Further experimentation showed that the cleaning process must be completed rapidly to prevent setting up reactions which in themselves acted to seal off pore space.

A third set of experiments, using sand consolidated under 1000-pound pressures showed loss of permeability up to 99.99 percent with iron bacterial water, of which 24 percent was due to iron bacteria water and the remainder to silica effect. With sulphur bacteria and algal precipitates loss in permeability ranged from 6 to 32.7 percent.

Study of bacteria size and pore space in oil sands shows that physically it is possible for these bacteria to penetrate the sands and, under favorable conditions, to develop clogging at a distance from the formation face.

Types of micro-organisms in oil-field waters change the chemical character of the water and cause precipitates which separately and collectively have strong clogging effects when water containing them is injected into oil sands. Ferric hydroxide can be removed in sand filters, algae can be killed with small amounts of copper sulphate, while a chlorine treatment is indicated for sulphur bacteria and fungi, with heating the water during treatment proposed as alternative purification method. The authors emphasized that their paper should be regarded only as a preliminary report of progress, not a solution of the difficulties outlined.

Salt Water Disposal in The East Texas Field

By W. S. Morris, *East Texas Salt Water Disposal Company*

A huge volume of additional oil is going to be recovered in the East Texas field as a result of re-injecting water produced from the oil formation. It is estimated that from 200 to 800 million barrels more oil will be recovered because of this work. This is equal to the total quantity most big fields will ultimately produce.

The first injection experiment well in East Texas was completed in 1936. It proved practical, and as a result operators started building their own injection disposal systems. However, it was impossible for owners of small leases to join in this type of work. With rising water output, it was decided to try and put disposal on a community basis so all operators could participate and make the additional 200 to 800 million barrels of oil recoverable. At that time there were 41 injection or disposal wells owned by 13 companies in the field.

Operators in the field subscribed $2,000,000 and the East Texas Salt Water Disposal Company was organized August 25, 1942. By October of that year the company had 1 disposal system and returned an average of 2957 barrels of salt water to the formation per day. Seven months later, or in April 1943, the company was operating 24 systems and returning 79,435 barrels of salt water daily to the Woodbine sand. Facilities are now on hand which when completed will give the company capacity to handle 125,000 barrels daily.

In October of 1942 the East Texas Salt Water Company was handling but 2957 barrels of the 87,007 barrels being disposed of. But in April, 1943, the company was handling 79,435 barrels of the 152,510 barrels being returned, and thus is responsible for the increase in salt water disposal in the field.

In October, 1942, the field produced 364,723 barrels of salt water daily and approximately the same amount of oil. Only 24 percent of the salt water was being returned. In April 44 percent of the 341,205 barrels of salt water being produced was returned to the formation. Considering the return of salt water, the total amount of fluid (both oil and water) being taken from the East Texas field is smaller than in last October, and this has had a beneficial influence on bottom hole pressure. Last October 1 the field had a bottom-hole pressure of 1020.71 pounds and on April 1 it had a pressure of 1020.44 pounds.

This paper was illustrated with photographs showing disposal systems constructed by the East Texas Salt Water Disposal Company.

Elasticity of Reservoir Rocks and Fluids with Special Reference to The East Texas Oil Field

By David Donoghue, *Consulting Geologist, Fort Worth, Texas.*

Tracing the literature on the subject of sand compaction and fluid compressibility, the point overlooked or minimized in some papers is that the pressure decline extends into the water-saturated zone westerly from the East Texas field and that the influence of a small pressure decline upon the large volume of water, sand, shale and clay in the Woodbine causes the movement of water in substantial volume into the relatively low-pressure oil-saturated zone. This movement is a direct effect of the expansion of the water and the reduction of the porosity of the reservoir rock; both phenomena resulting from pressure decline incident to the removal of oil from the immediate vicinity of the oil-water contact. Other factors are enumerated which complicate the problem. A pressure decline that would have full effect on the expansion of the fluids may not be fully effective in the compaction of the reservoir rock.

Making assumptions as to actual values and approximating conditions for Woodbine sand, compaction of sand must be considered in obtaining a complete exposition of reservoir performance.

Under the range established by assumptions and approximations, figures are derived to show that all or a large part of the 1,850,000,000 barrels of oil and gas and water produced to the end of 1942 from the East Texas field could have been replaced by water derived from the Woodbine, from an area extending some 30 miles in each direction from the field through the phenomena under discussion.

It should be apparent that in the East Texas field oil and gas production, reservoir pressure decline, expansion of the gas, oil and water and compaction of the rocks are complementary phenomena and that water drive, whatever it may be, needs a definition.

The Effect of Water on the Stability of Gasoline Motor Fuels in Storage

By Harry H. Power and Fraser H. Allen, *University of Texas*

The possible deterioration of 100-octane fuels has brought renewed interest in the factors affecting storage stability, particularly for extended periods under adverse conditions. Most gasoline is stored in contact with water since it is difficult to prepare and maintain an absolutely dry stock in plant-scale operations. To obtain data which may be of us in evaluating the effect of water on the stability of gasoline motor fuels a series of investigations under varying air-water-fuel conditions was undertaken, the process of gum formation being accelerated for test purposes by exposure of the samples to diffused sunlight. Deterioration is strongly photocatalyzed by ordinary daylight. The standard 2½-liter reagent bottles with loosely fitted ground-glass stoppers were used, all tests being compared to an identical control in each series, so that slight fluctuations in temperature were not significant.

The various types of tests run covered 14 samples of a chemically un-

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treated motor blend, with results indicating that the deterioration of intensively dried gasolines, as compared with gasoline containing dissolved water, shows that water is detrimental to storage stability. The authors classify gasoline storage conditions in the following order of increasing severity:

Storage of artificially dried gasoline under maintained conditions of absolute dryness.

Storage of water-saturated gasoline over a water phase which contains no dissolved air.

Storage of water-saturated gasoline in the absence of a water phase.

Storage of water-saturated gasoline over a water phase which contains dissolved air.

The second case constitutes the usual condition of gasoline storage, since water in a storage tank soon becomes deaerated. The effect of air above the gasoline, or the presence of a natural or artificial inhibitor in the gasoline, will not affect the relative order of the four classifications.

Intensive drying of a gasoline sample was found to reduce greatly the rate of gum and peroxide formation in stored gasoline.

Saturating a gasoline with water promoted deterioration.

Dissolved air in the water phase which is in contact with gasoline is particularly detrimental to storage stability.

The best practical condition of gasoline storage is in contract with an air-free water phase.

Productive Capacities of Flow Pipes on Gas Lift

By S. F. Shaw, *A. & M. College of Texas*

Experimental determination of flow pipes under varying conditions of submergence are being undertaken at the A. & M. College to present data from which can be drawn up graphs which will answer the two principal questions of practical value to the oil operator:

1. What is the capacity on gas lift of a pipe of given diameter and length, operating under a given submergence or flowing pressure at a given significant rate, when lifting a given character of fluid?

2. How much gas is required to lift a barrel of a given character of liquid through a pipe of a given diameter and length, under a given flowing pressure or submergence, at a given significant rate?

So far, the tests have covered 1- and 1½-inch pipe, in lengths of about 10½ feet, operating under submergences of 25 to 74 percent. Eight series, comprising 600 complete tests with nearly 4,000 observations, have been run on each size of pipe.

From data determined in the tests, graphs have been constructed which show the maximum quantity of fluid (water in the tests) that can be lifted with a given flowing pressure. The curves show that the maximum capacity rate does not vary directly as the areas of the two pipes, but, over the range covered, corresponds to a rate nearly 50 percent higher than the relative capacities of the pipes.

Tentative curves were drawn illustrating how capacity declines to very small quantities as the flowing pressure declines and the length of the pipe increases. The curves were drawn from graphs of actual wells and represent determinations at 4,100 and 6,500 feet. Extrapolations permitted extensions of the curves beyond these values.

The author submitted graphs covering various sets of flowing conditions at representative depths, illustrating the applicability of such plotted data to solution of gas-lift problems.

Pressure Behavior in Flowing Gas Wells

By L. V. Uhrig, *Humble Oil & Refining Company*

This paper presents examples of test flow data obtained from wells in several fields in the southwestern area of the United States. Although conditions and operating practices differ among areas, it is believed that the pressure behavior of the wells cited illustrates characteristics peculiar to certain kinds of well performance. If the wellhead pressure data are compared with the subsurface pressures, while keeping in mind the production, certain possibilities may be suggested for interpreting well performance from wellhead pressure and production data only.

Principal attention is directed to wells flowing through tubing which is swung in the well (without tubing packer) near the pay zone, since many existing wells are thus equipped. The majority of the examples cited illustrated conditions in wells which produce water or which have low productivity factors, since they offer the most immediate problem and deserve earliest attention.

The author points out that for oil and most water percentages, the tubinghead pressures were not a sensitive measure of subsurface pressure. It would appear that normal ratio wells might flow with extremely low sub-surface pressures, while high percentage water wells might have high sub-surface pressures to flow. In one well tested combined slippage losses were found to be equivalent to those resulting from about 30 percent water production at optimum velocities.

Results were cited of tests on oil wells producing no water, a well producing little water, very weak wells, high water percentage wells, and variable gas-oil ratio wells. The examples of test data presented typify the pressure differences effected in normal ratio wells having productivity factors and producing varying amounts of water. It appears likely that any oil well which flows with no liquid in the annulus must be producing some free gas, but some wells may flow for periods with high gas-oil ratios and still have liquid in the annulus.

Further Developments in Caliper Logging

By C. P. Parsons, *Halliburton Oil Well Cementing Company*

Discussing caliper logging with the aid of slides showing actual logs, the speaker emphasized the value of such logs in setting surface casing, especially in deep wells where possibility of blowout is great. The typical log shown illustrated the enlargement of a hole from 16 inches to 25, and indicated the proper casing seat, as well as giving data for cement required.

The use of the log to check hole variations attending a change in bit size brought out the interesting fact that under certain conditions bit change does not change actual bore diameter, and thus accounts for need of greater than calculated cement volumes. Such logs, by portraying the hole conditions at bit-change depth, show why packers sometimes fail to set and also give data necessary in selecting proper types of combination packers.

The variation in permeability throughout the area logged was shown in slides which indicated greater thickness of filter cake and consequent hole constriction, sometimes below bit diameter, opposite strata of greater permeability.

When regarding the logs for permeability characteristics, aid is given to geological correlation. Mud-cake thickness, in relation to penetrability was illustrated by sets of experiments in which various media were used within a pipe, on the end of which observable filter cakes were built, with observation of the pressure at which shut-off was obtained at the free end of the pipe. Cake thickness and shut-off pressures obtained check closely with interpretation of filter cake restrictions in the wall bore when penetrability has been checked through side-wall cores.

Other applications of caliper logging illustrated by slides showed excessive erosion in one well, in which the formation was salt, and on the evidence of which the well was abandoned. Erosion by the mud-return stream was demonstrated by dual runs of the caliper at 24-hour intervals. A check run after a month showed little more erosion than the 24-hour log.

Use of the calipers to determine the effect of acidizing, especially to learn whether the acid had penetrated the type of formation desired, was offered as another use of the device.

Few changes in design of the caliper have been made during the past year, due to reduction in personnel available for such work, but the arms have been lengthened so as to enable the instrument to measure up to 5 feet in diameter.

Many studies with the caliper are under way, in which data are being collected showing the change in well diameters throughout the drilling and completion cycle, affording a basis for comparison and interpretation of subsequent logs on other wells.

Analysis of Oil Production in the Near-Depleted Mexia-Powell Fault Line Fields of Texas

By H. B. Hill and R. K. Guthrie, *Bureau of Mines, Dallas, Texas*

Five closely grouped fields were developed during the 1920's along the Mexia-Powell fault line each of which yielded high-gravity oil in great quantities, each being the scene of intensive drilling campaigns which surpassed previous records for rapid, intensive development of productive areas. Each of the fields was developed rapidly; wells were spaced closely and high initial productions were reported; production peaks were reached early in the producing life of the fields; subsequent declines were rapid, and encroachment of edge water was early and rapid.

The authors described the geology and production characteristics of each field, presenting curves to show graphically rise of production, rate of drilling, and decline in output after a relatively short period. Results of later drilling in this area, in some instances as much as 15 years after the area had been considered drilled up, with an initial well spacing of less than 6 acres per well in any field, are shown, and production traced to the segregation of oil in local highs, water coning, and possible flushing of oil from sands into favorable

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areas during the flush production of the fields.

Effect of close spacing and rapid development where wells were permitted to flow wide open early in their producing lives is shown in the rapid decline in the rate of production. In 6 years the Mexia field decreased from 6782 to 705 barrels of oil per well per month, the Wortham field from 4686 to 279 barrels, the Currie field from 6962 to 472 barrels, the Richland field from 7130 to 235 barrels, and the Powell field, both shallow and deep production, from 3685 to 381 barrels.

Subsequently, production rates were maintained relatively constant, largely because many wells in which oil had been replaced by water were abandoned as unprofitable. Supplementary wells, drilled between old locations in the Wortham and Richland fields during 1940 and 1941 caused their production decline curves to rise perceptibly in 1941. The increase in monthly oil production per well in the Wortham field in 1941 was almost as much as it was in 1926, when the field was little more than two years old.

Decline rate in the five fields followed closely the drilling pattern. Wortham, drilled 1 well to 2.19 acres, showed most rapid decline; Richland, 1 well to 2.36 acres, comes next; then Powell, 1 well to 3.5 acres; Currie, 1 well to 5.8 acres; and the Mexia field, 1 well to 6 acres, showing least rapid decline.

Close spacing in these fields shows the belief of the times that to recover high percentages of oil from sandstone reservoirs, close spacing was necessary. Opinion now is that ultimate recovery of these fault-line pools was not increased measurably by close drilling, and that about as much oil would have been recovered, at considerably lower development cost, if fewer wells had been drilled.

Making certain assumptions to fill voids in data left by initial development methods, the authors estimate that Mexia field will yield ultimately 48.9 percent of the original 1766 barrels per acre-foot; Wortham 70.5 percent; Currie 43.6 percent; Richland 78.3 percent; and Powell 53.2 percent, before the fields are abandoned because oil can no longer be recovered at a profit. The paper was based on a complete report of investigations to be published by the bureau of mines.

Surface Tension of Crude Oils Containing Dissolved Gases

By D. L. Katz, R. R. Monroe, and R. R. Trainer, *University of Michigan*

The tension at the surface of a liquid in contact with a vapor is responsible for capillary action of liquids in porous solids. Methods of measuring surface tension either at atmospheric pressure or at elevated pressures are available. However, these measurements require rather elaborate apparatus and pains-taking efforts to obtain reliable data. Therefore it is desirable to have a method by which the surface tension of crude oils may be computed from the fractional analysis of the fluid. Recent measurements on the surface tension of the methane-propane system under pressure have provided the basis for the establishing of a relationship by which the surface tension of hydrocarbon mixtures may be predicted from fractional analyses. This paper presents methods of predicting the surface tension of hydrocarbon mixtures under pressure, such as crude oils saturated with natural gas. The calculated surface tensions of the oils containing dissolved gases appear to be in accord with previous measurements on crude oils containing dissolved gases and indicate that high-pressure reservoirs contain liquids having very low surface tensions.

Experimental data serve as basis for an equation used to predict surface tension under pressure from the composition of the mixture. The formula reproduced the data on the methane-propane system with an average deviation of less than 0.1 dyne per centimeter, including surface tension values as low as 0.19 dyne per centimeter. Since the formula is general in nature it is believed that it will apply to complex mixtures such as crude oils and gasoline.

In conclusion, the authors stated that the surface tensions of butane-gasoline mixtures were measured and used to demonstrate that the formula for computing surface tensions is applicable to complex mixtures. The surface tension of crude oil containing dissolved gases may be computed from molal composition of the equilibrium phases, the parachor for each constituent, the density of each phase, and the molecular weight of each phase. Surface tension data on heptane and heavier fractions for equilibrium liquids previously reported completed the necessary information for calculating the surface tensions of the oil and gas mixtures under pressure. These calculated surface tensions are in general agreement with data on crude oils containing dissolved gases. These results point to the probability of very low surface tensions (0.1 to 2.0 dynes per centimeter) for reservoir crude oils under high pressures. Low surface tensions tend to minimize the effects of capillary forces in displacing crude oil from porous media by high-pressure gases.

Analysis of Optimum Sucker-Rod Pumping

By D. O. Johnson, *The S. M. Jones Company*

Even though much has been written concerning pumping problems, there is still lacking an understanding of the simple fact that fast speeds place unnecessary loads upon sucker rods and related pumping equipment. This lack of understanding is not surprising when it is considered that not general agreement has yet been reached regarding the elemental calculations involved in the theoretical determination of peak polished-rod load or that of plunger travel.

Of the four formulae in use for the theoretical determination of maximum polished-rod load, the formula suggested by Mills,

$$P = W_r + W_o\left(1 + \frac{LN^2}{70500}\right),$$

where W_r is the weight of the rods in air and W_o is the weight of the fluid on the plunger area, L is length of stroke and N is the speed of operation in strokes per minute, agrees fairly well with actual determinations and is used in this paper to provide a basis for obtaining optimum pumping conditions as far as speed and stroke and plunger size are concerned.

Besides that of loading, the consideration of plunger travel is involved in the selection of optimum pumping operation. This involves rod stretch and the ensuing vibrations set up by the spring effect obtained through this action. It is quite easy to picture sucker rods stretching under their own weight. Stretch is also added by the fluid column. To this combined stretch there is also an additional amount placed by the acceleration forces occurring during the pumping cycle. Comprising all of these considerations, formulae have been devised that find remarkable agreement with actual plunger travel as determined by the bottom-hole dynagraph.

Using the two described methods of load and plunger travel calculations, a series of curves can be drawn for obtaining optimum pumping operation for any well condition. Calculations are first made for plunger travel and assuming 100 percent efficiency, tables are made with plunger size, polished-rod travel figures. The second step involves the calculation and plotting of production curves based on calculated plunger travel and the final step is that of checking the estimated load for these production operations.

Thus should a certain quantity of fluid be obtainable and desirable, the most logical pump-plunger size, the speed of operation and the limiting load to be placed on the sucker rod string may be determined that would produce this fluid amount under optimum conditions.

Natural Potentials in Well Logging

By W. D. Mounce, *Naval Ordnance Laboratory*, and W. M. Rust, Jr., *Humble Oil & Refining Company*

The extraordinary value of electrical well logging as a tool of petroleum engineers and geologists is indicated by the savings resulting from the elimination of much coring and the discovery of sands missed in coring. Paradoxically, the remarkable success resulting from the application of electrical logging to correlation and completion problems has cost some consistent users dearly.

The basic principal of electric logging and the customary interpretation were discussed, with the usual deductions from the variations shown in the log. The cause of this log variation, ascribed to "Electro-filtration potential," is shown not to be directly related to the permeability, for if such a log were principally the result of electro-filtration, it would be a permeability log. On the other hand, if the electro-filtration potential were affected by changes in pressure, it would be possible to determine permeability by running two logs at different pressures and observing the differences in the natural potential logs.

Actually, the authors state, the properties of the filter, which chiefly determine its effect on the electro-filtration potential, are its chemical nature and the condition of its surface. A factor frequently overlooked is the comparison between the permeabilities of the sand and the filter cake formed on the face of the sand from the drilling mud. This latter permeability is frequently 100 to 10,000 times lower than the permeability of typical oil sands and almost independent of the permeability of the sand; consequently, the resultant permeability is determined almost entirely by the filter cake. Thus, if the log did show permeability, it would be that of the filter cake, not that of the unrelated sand.

Even so, the permeability of the filter cake is higher than the permeability of the shale, so that the natural potential might be largely due to electro-filtration, and thus distinguish permeable sands from impermeable sand, shales or other materials, though the actual permeability could not be determined. Two experiments showed that the correlation between permeability and natural potential was poor, since it is demonstrable that less than 10 percent of the

observed potential resulted from electro-filtration potential.

The authors likewise demonstrated the fallacy of ascribing the remaining 90 percent to electro-chemical potential, by showing that the sum of such potentials around any point on the electrode must be zero. They carried out experiments which, based on observation of nonpolarizing electrodes, suggested that shale zones were the seat of the phenomena. From the results of these tests, the authors conclude that when fresh water drilling mud is used, the potential log may be largely a measure of the absence of argillaceous material in the formation. This conclusion is confirmed by the observation that large "kicks" are often found opposite beds of dense limestone and that most permeable beds that do not show "kicks" are found to contain substantial amounts of shaly material.

The Study of Reservoir Fluids By Surface Recombination Experiments

By H. H. Botset and M. Muskat, *Gulf Research and Development Company*

Essential production data may be generally divided into two broad categories: information about the reservoir (largely obtained from core analysis and well logging; and information about the petroleum fluids (P-V-T data). In general these latter data are obtained in either of two ways: bottom-hole sample analysis, or surface recombination of fluids as produced at the surface. This paper describes an apparatus developed primarily with a view toward obtaining as much simplicity of construction as possible so as to afford speed of manipulation, with as good accuracy as these factors would permit. The resultant overall error is believed to be about 1 to 2 percent, which is adequate for field use.

The authors stress field sampling as a primary requisite in satisfactory recombination work. Samples should be taken simultaneously of both oil and gas at the separator and, if possible, have these samples taken at pressures above 100 pounds, gauge. The well should be flowing under steady conditions at time of sampling. Specifications for proper sampling are given, with recommendations for the ascertaining of contributory data on pressures, temperatures and other well-head information.

Construction of the apparatus was described, and the experimental procedure outlined, tests being run separately on gas and oil samples to obtain information leading to the determination of suitable volumes of gas and oil for recombination.

Formation volume determinations with the apparatus were described and curves shown which demonstrated the effectiveness of the method.

The authors emphasized that considerable care is required in all the volumetric measurements and manipulations. The method is stated to be relatively laborious as several preliminary experiments are necessary before the final recombination procedure. An important advantage is that samples may be taken at the well with a minimum of interference with regular production, and at comparatively low cost. Additional information regarding the deviation factor for saturated gas in contact with the oil is also available by the method outlined, all results being in terms of both residual oil and stock-tank oil.

PIEA Meeting Features Maintenance And Protection of Equipment

Emphasizing conservation of present equipment and its maximum utilization for the duration of the war, the Petroleum Industry Electrical Association and the Petroleum Electric Supply Association, held its sixteenth annual convention, in Houston, May 5 and 6.

In the general sessions, the following papers were read and discussed: "Demonstration of Control of Static Electricity," by G. M. Kintz, Bureau of Mines; "The Petroleum Industry's Civil Air Raid Warning System," by Major James L. Whitcomb, chief signal officer, third Fighter Command; "Wartime Maintenance and Operation of Electrical Equipment," by W. E. Silvus, engineer, General Electric Company; "Electrical Power for War," by Frank M. Austin, vice president of Houston Lighting & Power Company; and "War Production," by Joseph H. Liston, WPB, Division of Information, Washington.

Of these papers, that on "Wartime Maintenance and Operation of Electrical Equipment," by W. E. Silvus, General Electric Company, was most directly applicable to the petroleum industry. The speaker pointed out the importance of proper care of all electrical devices, and stressed proper maintenance of electric motors. Stating that the three cardinal points in care and maintenance of motors are, cleanliness, lubrication, and dryness, he elaborated on these and brought out essentials such as the importance of keeping a card-system of checking. Cleanliness, lubrication, and keeping motors dry are largely routine matters, he observed, but a majority of motor failures can be traced to causes resulting from lack of attention to one of these essentials.

Advisability of a complete set of instruction books available to the man responsible for maintenance and operation of motors, was urged by the speaker. Such books are furnished by manufacturers and should always be kept on hand.

Checking Motors

Use of a card-system of checking motors concentrates attention on details that might otherwise be overlooked. Equipment should be inventoried and complete records kept as postings on the cards. Periodic checking of the cards may save expensive losses through prevention of shut-downs.

Meetings of the cathodic section were devoted to reading and discussion of papers devoted to cathodic protection of pipe. Most of the papers traced developments in cathodic methods by various companies, giving methods of installation and results. Titles of these papers with their authors, follow: "Experience with Zinc Anodes," O. C. Mudd, Shell Pipe Line Corporation; "Experiments with Zinc Alloy Anodes," Wm. E. Huddleston, Cities Service Gas Company; "Problems in Connection with the Cathodic Protection of Bare Pipe," W. H. Stewart, Sun Pipe Line Company; "Null Circuit for Determination of Current Requirements for Cathodic Protection Systems," K. H. Logan, United States Bureau of Standards; "Galvanic Couples," M. C. Miller, Ebasco Services, Inc.; "Prepared Discussion of Miller's Paper," W. F. Rogers, Gulf Oil Corporation; "The Practical Design and Economics of Cathodic Units as Applied in the Refinery," Dick Holsteyn, Shell Oil Company; "Cathodic Protection Coordination," G. R. Olson, United Gas

F. W. Littell, Shell Pipe Line Corporation, left, was elected president of Petroleum Industry Electrical Association at its annual meeting at Houston last week. Center is L. G. Wainman of El Paso, retiring president. J. F. Collerain, Houston Pipe Line Company, was elected secretary-treasurer.

Pipe Line Company; "A Laboratory Test on Somastic Coated Pipe," W. F. Levert, United Gas Pipe Line Company; "Current Density Related to Current Distribution," H. C. Gear, Lone Star Gas Company; "Control of Stray Currents from Cathodic Protection Installations," G. R. Olson, United Gas Pipe Line Company; "Supply Group Relation to Cathodic Protection," "Things to Come," M. C. Miller, Ebasco Services, Incorporated; "Electronic Holiday Detector," D. E. Stearns, United Gas Pipe Line Company.

New officers elected for the coming year included: F. W. Littell, Shell Pipe Line Corporation, Houston, president of Petroleum Industry Electrical Association; R. C. Appline, United Gas Pipe Line Company, Shreveport, vice president; J. F. Collerain, Houston Pipe Line Company, Houston, secretary-treasurer.

New officers of the cathodic section were: R. A. Brannon, Humble Pipe Line Company, Houston, chairman; William E. Huddleston, Cities Service Oil Company, Bartlesville, Oklahoma, vice chairman; R. H. Crowe, Stanolind Pipe Line Company, Tulsa, secretary-treasurer.

Dallas was selected for the next annual meeting.

Wichita Chapter API Holds Annual Meeting

Wichita Chapter of The American Petroleum Institute, at Wichita, Kansas, at its annual meeting, May 3, elected Joseph A. Kornfeld, Wichita Beacon, chairman; E. K. Edmiston, Auto Ordinance Incorporated, first vice-chairman; Carl Temple, The Texas Company, second vice-chairman, and S. W. (Cy) Holmes, Shell Oil Company, secretary-treasurer.

A. S. Ritchie addressed the meeting on "Transportation as Oil's Greatest Wartime Achievement."

The following were elected to membership on the advisory committee:

H. E. Zoller, Derby Oil Company; Owen Gosnell, National Refining Company; Fred Mallonnee, Magnolia Petroleum Company; G. A. Holloway, Lee C. Moore & Company; H. E. Miller, Lario Oil & Gas Company; Ralph J. Pryor, Pryor & Lockhart, Inc.; R. P. Moscrip, Shell Oil Company, Inc.; A. S. Ritchie, D. R. M. Drilling Company; M. C. Harrell, The Texas Company; William L. Ainsworth, Western Petroleum Exploration Company; D. Spencer Kates, Sharon Drilling Company; Frank H. Hollow, Hollow Drilling Company; Curt L. Henderson, Vickers Petroleum Company, all of Wichita; Max M. Mahaffey, Oil Hill, Cities Service Oil Company, and Harold M. Walmsley, Hutchinson, Skelly Oil Company.

Chemists to Meet in Chicago, May 15

The American Institute of Chemists will hold its twenty-first annual meeting on May 15 at the Edgewater Beach Hotel, Chicago.

Following a business session to be held in the morning, the afternoon session will be devoted to a discussion of the parts being played by certain vital products in the war. Speakers include Dr. Bruce K. Brown, Assistant Deputy Petroleum Coordinator, "Petroleum in the War"; Dr. Robert J. Moore, Bakelite Corporation, "Synthetic Resin Plastics"; Dr. H. E. Robinson, Swift & Company, "Meats in the War"; and Dr. David Klein, Wilson & Company, "Vitamins in the War."

At the banquet, the medal of the American Institute of Chemists for outstanding service to the science of chemistry will be presented to Dr. Walter Savage Landis, vice president of American Cyanamid Company, in recognition of his work in the field of the nitrogen derivatives. Dr. Gustav Egloff, president of the Institute, will present the medal, after addresses by Mr. Maximilian Toch on "Landis, the Man," and Harry L. Derby, president of American Cyanamid and Chemical Corporation, on the achievements of Dr. Landis. An acceptance address will be delivered by Dr. Landis.

Commission Contracts For 28 More Tankers

Contract for construction of another 28 tankers, to be built by the Alabama Dry Dock & Shipbuilding Company at Mobile, Alabama, has been announced by the Maritime Commission.

The commission earlier had announced contracts for 206 tankers, making a total of 234 oil carriers ordered during April.

Rock Classification May Aid Discoveries

A classification of sedimentary rocks, which may be of great help in discovering new oil fields, has been made by Dr. Paul D. Krynine, assistant professor of petrology and sedimentation at Pennsylvania State College. Through finding the essential microscopic characteristics of various types of rocks, Dr. Krynine has been able to make the classification, based on the evolution of sedimentary rocks.

The place of rock or sand in the classification indicates where and what type of oil may probably be found. According to information released by the college, this is the first systematic petrographic classification of sedimentary rocks ever made.

Dr. Krynine believes that characteristic composition and texture of rocks are intimately related to the movement of the earth's crust many million years ago. Texture or appearance as well as the chemical and mineral composition of different types of sand indicate the geologic changes they have been through in the earth's evolution.

For example, he points out that oil in California comes from sand or rock reservoirs produced during mountain-making motions of the earth. Through the microscope the pattern of these rocks looks different from the oil-bearing sands of eastern United States and most of the Gulf Coast which have been formed during milder motions of the earth. When the earth is relatively quiet, a third type of rock is formed which becomes the reservoir from which the oil of most of the Mid-Continent and East Texas is derived.

Since most of the so-called anticline fields in the United States have now been discovered and the future of oil production rests on finding new fields or in stepping up production from old ones, it is believed that Dr. Krynine's classification may be an important factor in new discoveries.

Texas Commissioners Oppose Brown's Plan

Texas Railroad Commissioners Buford Jester and E. O. Thompson were prompt in voicing their opposition last week to the proposal by Price Administrator Prentiss Brown that the federal government subsidize wildcat operations. Both commissioners directed their complaints to government in business; neither mentioned the fact that subsidy of wildcat operations would be of no help to the stripper-well operator faced with low production, fixed prices, and mounting costs.

In a telegram to Brown, Thompson said:

"How does one go about getting this money? Does the government have to approve the location? If so where, when and to whom does one apply?

"Can anybody drill these wildcats or do you have to have experience? The reason for this question is that many great oil fields in Texas have been discovered by relatively inexperienced independent operators.

"This need for new discoveries is most pressing and vital for the successful prosecution of the war. Time is of the essence. We must get these test wells started immediately. This proposal fails wholly to care for the stripper marginal well operators who are the backbone of the oil production."

In a statement directed to the public, Jester said: "The OPA Administrator's reasons for denying the increase are as unsound as the proposal of government subsidy to encourage wildcatting and the discovery of new reserves of oil.

"The logic of economics and the history of the oil industry show that new production three years hence would be the result of an adequate crude-oil price now. Furthermore the oil industry with the assistance of regulatory bodies has made out a case for the price increase which Petroleum Administrator Ickes recognizes, and has, as a consequence of his study, recommended.

"We are not going to win this war by 'holding the line.' Our job is to furnish our fighting forces and those of our allies with war-making essentials. Oil is one of the most vital commodities required for the war effort."

Operator Says Tax Credit "Would Get Job Done"

Asserting that Price Administrator Brown's plan for subsidizing wildcatting is not practical, Maston Nixon, vice president of Southern Minerals Corporation, Corpus Christi, Texas, urged emergency legislation permitting companies special tax credit for dollars lost in drilling non-productive wildcat wells in a telegram to Petroleum Administrator Ickes, May 7.

Nixon, in suggesting the plan as an alternate to the refusal to increase crude prices, explained that if an operator drilled six non-productive wells during the year at a cost of $150,000, the government would allow $300,000 credit against the operator's taxable income for that year.

The Texan declared such a program would stimulate wildcatting by companies experienced in finding oil and would get the job done, further saying "I believe this is an acceptable substitute for a price increase."

Independents Are Facing Situation Realistically and With Energy

By FRANK B. TAYLOR, Staff Writer

A THOROUGH analysis of the current situation in the petroleum industry was made before a highly interested attendance at the mid-year meeting of Independent Petroleum Association of America held in St. Louis, May 7 and 8. The broad scope of the industry today, both as to the war effort and as to the independent producers' problems were discussed by outstanding authorities from the industry, and from Washington officials concerned with the industry. There was a general and noticeable tendency to face the present situation from a realistic viewpoint and with increased energy.

After a day of committee meetings related to association affairs, the convention opened at breakfast with an address by President Frank Buttram on "The Independent Is at the Cross Road." He deplored today as being an era of national "hopelessness" and stated that he could not agree with this theme. This attitude is a foreign expression comparable to national socialism, and he stressed that it would not work in the petroleum industry. If, he suggested, the socialist state is applied as put forth by Sumner Pike who advised Prentiss Brown, OPA, against a crude price raise, then the petroleum industry cannot progress to its originally planned part in the war effort.

The pressing problems, he pointed out, are shortages of materials, shortage of manpower and transportation of oil. In regard to the latter, an excellent job has been done, Buttram asserted, but stated that the situation remains critical. He also called attention to adverse influences antagnostic to the interests of the petroleum industry and to the nation at large during this period of conflict. In this he referred to Secretary Hull's foreign trade reciprocity agreements and to the national socialist approach evident in some bureaus. He added that the decline in new oil must be stopped and illustrated this with the fact that independents account, during normal times, for 75 percent of the discoveries. This can only be continued under free enterprise, he said.

Those in Washington who oppose this American way, he asserted, imperil not only the petroleum industry but the nation as well. He concluded that in actuality, the independents are definitely at the cross roads.

War Situation Discussed

Ralph T. Zook, Sloan and Zook, Bradford, Pennsylvania, addressed the convention on "War and the Industry." Zook, who recently concluded an orientation course at Fort Leavenworth, where a class of 85 businessmen were instructed in the business of war and military situations, illustrated his talk with slides of the European Theatre. He briefly analyzed the situation which brought on the war and proposed certain questions to the group, any of which could have a tremendous bearing upon the ultimate outcome or upon the direction of the conflict. One of these questions he offered was Russia. Another question was Spain. In addition, there are many other unknowns that are constantly affecting the turn of war events.

In discussing the petroleum phase of the war, he showed that while the oil situation is critical in Germany, during periods of defensive effort, the Axis nation can add to reserves although during offensive action, more oil is used than is available. With Japan the situation is different for that nation has acquired more oil than it needs in its war program.

In analyzing the problem of invasion, he showed that 11,000,000 tons of shipping would be required, this being in excess of all available tonnage. The picture he drew was the current one which he showed might radically change in the coming year. He did hold that the nation and the public should be realistic, and with reservations, predicted a long war.

After the War

"Postwar Planning for Independents," by Paul Ryan, chairman of the Postwar Planning Committee of the Petroleum Industry War Council, was an analysis of the necessity of planning for the future and Ryan attributed much of the efforts as an outgrowth of war. He called for three postwar adjustments, these being:

A revision of the relationship of government to business;

The work of one industry as it relates to another, and the individual company problems. The industry's large investment must be carefully dealt with after the war, he said, and suggested that some forms of government control would be required to protect against inflation. He termed this as a type of mass policeing but held that the policy of scarcity in industry is gone for good.

He stated that in his belief the OPA attitude has been in error, and that this has resulted in chaining oil production and exploration. An ill-balanced oil-war effort has likewise resulted, he said.

Following the war, Ryan said he anticipates an increased price for refinery products, enabling the refiner to pay more per barrel for crude, but realize a profit through refining the more valuable products now possible to produce.

These special products will supplement normal output and refinery materials. In concluding he pointed to the increased demand for normal crude petroleum in the United States and suggested that rather than allow other types of fuel to replace oil in some Eastern areas, it would be wise to import low grades of fuel crudes. In support of this suggestion he indicated that national use is greater than the nation's ability to produce, and this difference must be accounted for in some manner.

N. T. Gilbert, Midstates Oil Corporation, Tulsa, treasurer of the association, gave brief report of the financial status of the group.

Congressman Walter C. Ploeser of Missouri addressed the association at luncheon and stated that OPA, through its action on the price question, has assumed full responsibility for the threatened oil shortage. Ploeser, a member of the small-business committee of the House of Representatives, stated that the trend currently noted suggests possible shortage for our armed forces, and definitely indicates shortages for the civilian. Crude oil is so low in comparison with other prices that exploration and discovery have fallen off at an alarming rate, he pointed out, and in addition secondary recovery is on the down-grade. He held that a price increase is definitely in order to immediately encourage new exploration, discovery, and maintenance of needed reserves.

This war is fought as much with oil as with food, he said. We are rationing oil and gasoline because of shortages of rubber and transportation, but when the transportation bottleneck has been corrected and synthetic rubber is ready for civilian use, the present downward trend in the discovery and production of oil indicates that we may again be faced with the need for oil and gasoline rationing, due to the shortsighted policy of the Office of Price Administration. Idle private automobiles and cold homes may be the result of this OPA action.

Small business units will be permitted to serve under an adequate oil price ceiling. Secretary Ickes testified before the small business committee that due to the failure upon the part of the OPA to allow reasonable increases in crude-oil prices the monopolistic control over the oil industry by the twenty major companies has increased from 60 to 70 percent. This is alarming and threatens our American system of free competitive enterprise, and this is certainly demonstrated in the oil industry. The same blunderous policies that are now being followed were practiced during the last war, which resulted in postwar price increases. As a result, the public suffered much more acutely than they would have had reasonable prices been permitted in accordance with current production demands. OPA holds the life and death veto power over this essential production for the war and civilian supply, and they ignore the heavy and original responsibility of the Petroleum Administrator for War. All of this demonstrates a continued ineptitude of general executive direction in Washington which continues to put eco-

nomic brakes upon the speedy prosecution of the war, and unnecessary burdens upon the civilians on the home front," he concluded.

Don R. Knowlton, PAW director of production, spoke on "What Materials Will Be Available for 1943 Drilling," and termed the subject of materials for oil producers a serious problem and one that he was glad to have the opportunity of discussing before the group. With the material question is bound the problem on drilling the projected 16,000 wells during 1943, he held that insofar as the producing branch was concerned, the materials situation is even more critical today than it has ever been.

Knowlton traced the materials question from the first control started in June, 1940, to the recent priorities system and to the current controlled-materials plan which evolved from the production-requirements plan. These, while possibly not complete, are doing the job today. He described the working of this plan and how it functions by quarterly estimates, all based upon industry requirements. Claimant agencies have each made requirements estimates and these are so adjusted as to allow their fullfilment as is indicated expedient by materials available and by value to the war effort. He assured the group that PAW is acutely aware of the necessity for securing all the material possible for production operations and every effort will be made to secure such needed materials.

Manpower

The question of petroleum industry manpower was discussed by G. E. Dewey, who took the place of N. C McGowen of Shreveport, on the program, and by W. N. Bonner of Houston. Each detailed the essentiality of the tasks in the petroleum industry and held that greater care must be exercised in judging the value of men to the industry.

Dee Campbell, Wichita Falls, I. C. Huff, Jr., Houston, John M. Morrison, Wichita, A. L. Oliver, Long Beach and Chas. Van Vleck, addressed the association on "Recruiting IPAA Manpower."

H. B. Fell, chairman of the committee on crude-oil requirements, reported to the association and analyzed this aspect of the immediate future. He detailed the present status of requirements and projected them into the future, showing at the same time the influence of current trends.

Walter S. Hallahan, Charleston, West Virginia, president of Plymouth Oil Company, spoke on "The Price Incentive in the Petroleum Industry," and stressed that the price structure is bound at the rate of discovery of new reserves, and that the question of reserves is becoming increasingly critical. Also he contended, this situation is no longer a problem of the oil industry alone, and the time has passed for it to be discussed within the limited and perhaps prejudiced sphere of its effect upon the industry. The situation is now national and international in character, he pointed out, in that it holds grave consequences for our domestic economy.

The oil indsutry was described as being in the position of a merchant who is rapidly emptying shelves of merchandise and finds increasing difficulty in replenishing his wares. Ultimately and quickly, such an ill-balanced program would force final exhaustion of crude oil sources. There is one remedy which is an increase in the price of crude oil so operators would be justified in producing stripper wells and at the same time wildcat to restore depleted reserves. While the price increase recommended by Ickes is insufficient to produce the desired result, it is a step in the right direction. The incentive of reward for work, risk and effort must be reintroduced into the oil industry.

The speaker further analyzed the situation by pointing out the evident lack of understanding evidenced by certain parties in Washington. An instance is the conception expressed concerning the withdrawal of reserves as needed. Any practical oil man knows this is impossible . . . that present reserves cannot be produced in less than 50 years. Reality has not been faced; the oil industry and the country face a condition, not a theory. Hallahan pointed out that the economic planners in Washington have been using the war emergency as a screen behind which to carry out their destructive policies. As proof of that, he exhibited a booklet published by OWI entitled "Battle Stations for All," millions of which have been published under the guise that they promote the war effort when in reality they are nothing but unadulterated propaganda for the economic theories of the administration. Various tax proposals advanced by the Treasury department but rejected overwhelmingly by both houses of Congress and including the depletion allowance, are included in "Battle Stations for All."

Hallahan further pointed out that many evasions were made, and many impractical offerings tendered the oil industry such as a subsidy as postwar credits, etc., all of which lacked justice and fair play in addition to being additional regimentation and control. OPA, he held, has deliberately evaded and ignored the intent of Congress in setting up that agency, and has gauged profits without regards to a small firm, thus establishing a monopolistic trend by forcing sale or disposal of independently operated properties. Foremost among the Washington bureaucrats is Sumner Pike, advisor to the price administrator, who has set himself up as a barrier to efforts of the oil industry and has overruled suggestions of the Petroleum Administrator, the small business committee of the House of Representatives, the Cole Committee and others. In concluding, Hallahan stated that the time has come to fight not only for the existence of the independent operator, not only for the existence of the industry, but for our national existence. The case must be taken direct to the people.

Saturday afternoon was devoted to further study of a price incentive as influencing secondary recovery, wildcatting and the operation of stripper wells. Charles P. McGaha, Wichita Falls, and president of the National Stripper Well Association, defined the stripper well as being "any oil well which is operated at a cost which approximates the revenue derived from the sale of its production," and supplemented this by observing that this held regardless of depth.

A. C. Simmons, of Bradford, discussed price and its adverse influence on secondary recovery. He noted the continual drop in new secondary-recovery effort and explained the inability of the operator to prosecute a flood or repressuring project with no margin or with continual operation at actual loss.

Ralph J. Pryor, Wichita, analyzed the effect of price on the stripper well, showed the value of the production from these wells to the entire industry, and affirmed that they were suffering from premature abandonment as a result of inability to operate.

Senator E. H. Moore of Oklahoma, addressing the convention Saturday evening, recountered the industry's hampers from directives out of Washington.

Other Companies May Join Stanolind Line Project

Four or more companies are to participate with Stanolind Pipe Line Company in the movement of Permian Basin crude to Drumright, Okla., terminal where connection can be made with relay lines extending north and to the East Coast, in the event the company's recently proposed 386-mile carrier is given government approval.

The original project called for the laying of 16-inch pipe from the Slaughter field, West Texas, to the Oklahoma pipe line junction point. But it is now apparent that a 20-inch line may be needed to handle the anticipated traffic. The larger diameter carrier would have rated capacity of 156,000 barrels daily, using single booster station and traffic could be materially increased when intermediate station equipment becomes available. Surface elevation is about 3600 feet in Slaughter field, with gradual drop to 1000 to 1600 feet before reaching hill country of southern Oklahoma.

Pipe mill facilities now engaged in processing the 20-inch government products carrier are due to complete early in September, and if the steel is made available for Stanolind Pipe Line Company's line, no change over would be necessary at the mills. Space in the Slaughter-Drumright project would be allocated to the operating company, Standard Oil of Ohio, Standard of New Jersey, Socony-Vacuum Oil Company and The Texas Company, while others may participate.

Petroleum Industry Injury Record Improved in 1942

Despite the disorganizing effects of wartime conditions, the annual summary of injuries in the petroleum industry for 1942 shows lower frequency and severity rates, according to figures compiled by the American Petroleum Institute Department of Accident Prevention. The 9 percent reduction in severity, as well as the slight reduction in frequency, is especially noteworthy because of the upward trend in accident rates for many industries.

The 1942 oil company frequency rate of 11.72 was only 1.1 percent above the all-time low frequency figure of 11.59 reported for 1940. The 1942 severity rate of 1.31 was the lowest on record. The 104 fatalities and permanent total disabilities for 1942 were the equivalent of 31 per 100,000 workers, as compared with 33.9 per 100,000 reported for 1941, or a decrease of 8.6 percent.

The 1942 report includes 180 oil companies employing 335,328 persons, which is 8 more companies and 2206 more workers than were included in the 1941 annual summary.

Refinery Runs Reach New 1943 High But Fuel Oil Output Still Too Low

For the second consecutive week, crude runs to stills reached a new peak for this year in the week ended May 1, having averaged 3,849,000 barrels daily, with the result that production of both residual fuel oil and gasoline were substantially increased. Desipte the larger output, however, the stocks of both those leading products were further drawn upon in meeting demand, and the inventory of residual declined to a new low for recent years.

Production of light fuel oil was cut back, with current consumption seasonally lower because of warmer weather, but the product apparently is being taken in as large volume as available, for storage if not current consumption, and there was a substantial withdrawal of it from storage, equivalent to the reduction in production from the previous week's output.

Crude oil production continues in line with prevailing comparatively heavy refinery runs, having been not far under the year's peak in averaging 3,919,000 barrels per day in the week ended May 1. The production has continued sufficiently high to permit uninterrupted gradual accumulation of stocks.

Crude runs to stills at 3,849,000 barrels daily were 112,000 barrels a day higher than in the previous week and 414,000 barrels (12 percent) above the rate of 3,435,000 barrels daily for the week ended May 2, 1942. At the new rate, the refineries of the country were operating at 80 percent of capacity. Those in California used 92 percent of capacity running 755,000 barrels of crude daily), Rocky Mountains 64 percent, upper Mid-Continent 85 percent (355,000 barrels daily), Middle West 88 percent, Appalachian region 90 percent, and the combined East Coast-Southwestern districts 72 percent (having charged to stills 1,762,000 barrels of crude daily).

Although the production of residual fuel oil was 146,000 barrels greater in the week ended May 1 than in the previous week, it was necessary to withdraw 464,000 barrels more from low stocks. All districts increased production except Oklahoma-Kansas and Rocky Mountains, and all added to storage except California, whose 1,036,000-barrel withdrawal more than cancelled the additions in the rest of the country. That withdrawal occurred while California produced 59,000 barrels of residual in excess of the previous week's output. The net reduction of 464,000 barrels in U. S. stocks for the week left inventories at 66,991,000 barrels, off 12,178,000 barrels (15.3 percent) from the 79,169,000 barrels held on May 2 last year. The production of 8,314,000 barrels for the week was 1,427,000 barrels (21 percent) in excess of that in the corresponding week a year ago.

All districts reduced production of gas oil and distillate fuel in the week of May 1, and all took the product from storage except the Middle West and California, with the greatest withdrawal that of 734,000 barrels for the East Coast-Southwest. The draft on storage occurred in the face of production which, despite reduction from the week before, was 12 percent greater than in the like week last year. Stocks of the

Crude Oil Production in the United States

(Estimates compiled by The Oil Weekly. All figures indicate daily averages, in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED May 1	May 8
Arkansas	72,250	72,600
California	777,100	773,150
Long Beach	32,150	34,350
Midway-Sunset	54,800	56,750
Kettleman Hills	42,900	43,600
Wilmington	93,750	95,100
Rest of State	553,500	543,350
Colorado	6,600	6,650
Illinois	229,550	236,150
Salem	31,100	31,300
Louden	40,000	39,800
Other New Pools	146,650	153,650
Old Pools	11,800	11,400
Indiana	12,400	14,150
Kansas	316,250	293,050
Kentucky	12,200	21,450
Louisiana	346,600	348,500
North	88,350	88,900
South	258,250	259,600
Michigan	57,250	58,700
Mississippi	55,350	54,550
Missouri	90	95
Montana	20,900	23,750
Nebraska	2,150	2,200
New Mexico	97,500	97,300
New York	14,150	14,650
Ohio	8,550	9,000
Oklahoma	342,350	346,950
Oklahoma City	57,750	64,950
Seminole Area	77,750	78,500
Rest of State	206,850	203,500
Pennsylvania	44,900	49,500
Tennessee	35	35
Texas	1,391,800	1,504,150
Upper Gulf Coast	340,850	375,450
East Texas Field	320,350	339,400
Rest of Eastern Texas	99,850	124,650
Lower Gulf Coast	117,400	138,850
Southwest Texas	54,700	58,300
South Central Texas	17,750	17,150
West Texas	214,650	226,900
North Texas	135,150	132,050
Panhandle	91,100	91,400
Utah	10	10
West Virginia	8,100	10,650
Wyoming	97,600	97,900
Total United States	3,913,685	4,035,140

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

ITEM	Crude Oil Prod. Barrels Daily	Week Ended	Runs to Stills Barrels Daily	Week Ended	Crude Stocks Barrels	Week Ended	Gasoline Stocks Barrels	Week Ended	Gas Oil & Distillate Stocks Barrels	Week Ended	Residual Fuel Oil Stocks Barrels	Week Ended
Highs:												
1939	3,910	8- 5	3,650	10-21	278,607	5-26	87,769	4-22	39,562	10-28	116,237	8-26
1940	3,890	3-16	3,690	6-22	265,865	8-31	102,817	4-20	49,051	10-19	109,135	9-14
1941	4,337	11-22	[1]4,120	10-18	266,187	3-29	99,727	3-29	[1]54,983	11-15	102,448	1- 4
1942	[1]4,337	2- 7	3,961	1- 3	263,208	3-28	[1]109,281	3-14	49,861	11-14	95,857	1- 3
1943	3,949	4-10	3,849	5- 1	242,035	4-24	94,159	3-20	42,913	1- 2	72,881	1- 2
Lows:												
1939	[2]1,601	8-26	3,125	2-18	[2]229,127	10-12	71,152	10- 7	20,722	4-15	105,397	4- 8
1940	3,335	11-30	3,370	1- 6	237,339	1-27	79,847	11- 9	23,551	4- 6	102,344	2-10
1941	3,364	1-11	3,490	1-18	240,399	11-15	79,923	10- 4	28,381	4-12	90,914	7-12
1942	3,297	7- 4	3,393	5-23	231,896	12-12	75,934	12- 5	29,240	4-25	72,962	12-26
1943	3,821	1- 9	3,579	3-13	232,191	1- 9	82,420	1- 2	30,732	4- 3	66,991	5- 1

Trends in Week Ended:	Crude Oil Production Daily	Crude Oil Runs to Stills Daily	Crude Oil Stocks Week End	Gasoline Production Weekly	Gasoline Stocks Week End	Gas Oil and Distillate Production Weekly	Gas Oil and Distillate Stocks Week End	Residual Fuel Production Weekly	Residual Fuel Stocks Week End
1942:									
January 3	4,038	3,961	244,440	13,797	92,987	3,855	49,357	6,918	95,857
January 31	3,871	3,848	250,740	13,292	97,810	3,817	40,674	6,640	91,189
February 28	4,016	3,675	259,373	12,131	105,635	3,799	34,547	6,813	88,285
March 28	3,820	3,667	263,208	11,663	105,624	3,661	31,756	6,344	83,045
April 25	3,581	3,506	257,073	10,535	102,897	.....	29,240	.....	81,107
May 30	3,877	3,522	255,023	10,478	95,355	.....	31,384	.....	79,628
June 27	3,719	3,581	253,364	10,713	88,396	.....	32,851	.....	77,304
July 25	3,691	3,658	249,262	10,864	82,281	.....	35,966	.....	77,816
August 29	3,964	3,697	249,007	11,300	80,831	.....	42,060	.....	78,034
September 26	3,909	3,802	242,785	10,954	80,550	.....	45,945	.....	78,943
October 31	3,901	3,731	239,266	11,153	79,159	.....	48,131	.....	79,166
November 28	3,878	3,736	234,850	11,269	78,854	.....	49,739	.....	77,796
1943:									
January 2	3,871	3,734	233,938	10,957	82,420	4,285	42,913	7,683	72,881
January 30	3,826	3,698	233,863	10,339	88,830	3,888	37,057	7,452	70,763
February 27	3,873	3,709	235,217	10,566	93,157	4,230	32,939	7,839	70,140
March 27	3,896	3,742	239,126	10,231	94,079	3,541	30,980	8,018	67,938
April 24	3,913	3,737	242,035	10,583	91,001	3,954	31,142	8,168	67,455
May 1, 1943	3,919	3,849	.....	10,977	90,029	3,629	30,791	8,314	66,991
May 2, 1942	3,335	3,435	[4]257,073	10,409	101,591	3,234	28,876	6,887	79,169
Change:									
In week	+6	+112	+614	+394	—972	—325	—351	+146	—464
In year	+584	+414	—15,038	+568	—11,562	+395	+1,915	+1,427	—12,178
In year	+17.5%	+12.0%	—5.8%	+5.4%	—11.3%	+12.2%	+6.6%	+20.7%	—15.3%

[1] All time peak. [2] Lowest since April, 1922. [3] Lowest since October, 1922, due to shutdown of six Mid-Continent States. [4] Stocks, April 25, 1942.

light fuels at 30,791,000 barrels on May 1 were 2,000,000 barrels (6.6 percent) above those of 28,876,000 barrels on hand May 2 last year.

Gasoline production was increased in all districts except the Appalachian and Rocky Mountain, but that product went to storage only in the Middle West and California, with other districts causing a national withdrawal of 972,000 barrels. At 90,029,000 barrels on May 1, the stocks were 11,562,000 barrels (11.3 percent) under the 101,591,00 barrels held May 2, 1942.

Crude oil production arveraged 3,919,-00 barrels daily in the week ended May 1, up 6,000 from the previous week and up 584,000 barrels (17.5 percent) from the 3,335,000 barrels per day produced in the week of May 2 last year. Stocks of crude oil were further increased 614,000 barrels in the week ended April 24, when they totaled 242,-035,000 barrels, but the latter figure was 15,038,000 barrels (5.8 percent) short of the 257,073,000 barrels held April 25, 1942.

Refined Products Scarce; Crude Raise Still Sought

Oil industry markets continue generally tight. Warmer weather has somewhat alleviated shortages of fuel oil in the East Coast district but gasoline still is extremely short.

Meanwhile, there is great dissatisfaction among producers over the definite refusal of the Office of Price Administration to grant the 35-cent increase in crude prices recommended by the petroleum administrator; and it is considered possible that an increase may yet be gained, through Congressional action if necessary.

New England was especially hard hit by the fuel oil shortage, but considerable relief has been provided through advent of warmer weather and shipments in drums by box cars, in supplementing tank car receipts.

At practically all North Atlantic points the supplies of gasoline are very short and becoming even shorter. Bunker oil and heavy fuel oil remain tight, although light fuels now are more readily available than heretofore.

In the Western Pennsylvania refining district markets for all refined products are strong, with even the neutral oils in good demand, in contrast with former protracted weakness. Bright stocks are closely held. Gasoline is particularly scarce, and similarly strong demand prevails for kerosene and burning oils. Refiners in most instances are currently shipping out all current production and therefore are unable to accumulate stocks, despite being low on all inventories.

In the Middle West there is continued strong demand for gasoline and residual fuel oil, with supplies extremely difficult to obtain. Light fuel oil and kerosene also are very short. Refiners of the district report much difficulty in securing adequate supplies of crude oil.

Refiners of the upper Mid-Continent are seriously concerned over the possibility of a shortage of gasoline and perhaps other products in the not-distant future, in view of present scarcities and the outlook for increased demand.

Gulf Coast refiners are encountering steady demand for all products. Kerosene is particularly scarce, and supplies of both light and heavy fuel oils are limited.

Permian Basin Oil Will Begin Moving Through Big-Inch Line This Week

Diversion of Permian Basin sour crude to War Emergency Pipe Line, Inc.'s Longview-Norris City 24-inch carrier for batching along with regular runs from the East Texas field will begin about May 10. This starting date is contingent upon completion of delivery of 1,000,000 barrels of Gulf Coast Grade B crude, averaging 33-gravity, that is being moved from storage along with current production from nine fields between Pierce Junction and East Orange through Sun Pipe Line Company's reversed 10-inch line between Beaumont and Longview. The big-inch system is expected to restrict its shipments to two grades of products while dependent upon a relay pipe line and tank cars for outlets at the Norris City terminal.

The decision to forego the scheduled movement of heating oil along with East Texas crude and draw upon the supply of Permian Basin crude so as to accelerate refinery operations on the East Coast will involve a major shift in operation of private systems in Southeastern New Mexico and Texas.

The entire capacity of Sun Pipe Line Company and Pan-American Pipe Line Company's combination 10- and 12-inch carrier between Houston and Longview, and Atlantic Pipe Line Company's Atreco-Longview reversed 10-inch will be utilized during the two-month period that sour oil has been definitely booked for the big-inch line. Humble Pipe Line Company will contribute 10,000 barrels daily through the routing of a portion of its Permian Basin runs via Hearne then through a reversed pipe line unit via Mexia to Longview.

Revised schedule calls for the entry of 115,000 barrels of sour oil daily, including 5000 barrels of Silsbee field crude that is dependent upon Atlantic Pipe Line Company's Atreco-Longview line for an outlet, into the big-inch line during the first month ending about June 10. The volume of sour oil is to be reduced to 70,000 to 75,000 barrels daily during the second month, while at same time an equal amount of sweet crude originating in the Corpus Christi district is to be included for the first time in the deliveries to Norris City.

Corpus Christi district crude will be routed through Southwest Emergency Pipe Line, Inc.'s converted natural gas carrier to Houston. Thence via Pan-American Pipe Line Company to Longview. Substantial backlog of stocks have been accumulated in Corpus Christi district, otherwise this volume of crude would not be available. When operating on normal schedule the Corpus Christi-Houston combination 14- to 16-inch line will supply 25,000 barrels of heating oil daily along with crude to the cross-country carrier.

Upon the filling of tank cars now en route for loading at its Jefferson rack, near Rodessa field, Atlantic Pipe Line Company will discontinue tank car shipments of Permian Basin crude to the Atlantic Refining Company's refinery at Philadelphia, and build up stocks at the Longview terminal. Atlantic Pipe Line Company has been transporting 16,500 barrels of sour oil via Atreco and Longview to Jefferson rack for several weeks.

Humble Pipe Line Company's tender of 10,000 barrels of sour oil daily to the big-inch will be supplemented by the routing of 5000 barrels daily from Hobbs, Monument and Eunice fields, Lea County, New Mexico, and 10,000 barrels daily from Andrews and Ector counties through Atlantic Pipe Line Company's System.

The New Mexico movement will be facilitated by Atlantic Pipe Line Company temporarily taking over gathering lines of Humble Pipe Line Company. The latter will make deliveries from the two West Texas counties by tying into Atlantic Pipe Line Company's 10-inch in the north end of Foster field.

Texas-New Mexico Pipe Line Company's owners will divert 15,000 barrels daily of sour oil to Pan-American Pipe Line Company at the Houston junction of the two lines, but substantial withdrawals will be made from excessive stocks on hand at the Galena terminal of the former near Houston.

Surplus stocks of sour crude held in the Houston-Beaumont territory and of sweet crude in the Corpus Christi district will be removed, else appreciably reduced within the next two months. This development will reflect a firmer market for sour oil, and lead to higher nominations by field purchasers. The Permian Basin district is due to receive an increase of 21,000 barrels in daily allowables during the second month since stocks will not be available to maintain delivery schedules.

Hold Rodessa Conference May 12 at Shreveport

A joint meeting of Louisiana, Arkansas and Texas representatives to consider uniform production regulations for Rodessa field has been announced by H. W. Bell, Director of Minerals of the Louisiana Department of Conservation. The meeting will be held on Wednesday, May 12, beginning at 10 a.m. at the Washington-Youree Hotel in Shreveport.

Texas Hearing Set

The next Texas statewide proration hearing has been scheduled by the Texas Railroad Commission for May 19, at Austin.

California Output Falling Behind Mounting Demand

California oil producers began the second quarter of 1943 struggling unsuccessfully to match production with continuously climbing daily total petroleum demand. According to Bureau of Mines reports just completed, March demand established a new high record of 869,000 barrels daily, 25,000 barrels higher than the previous record made in June, 1942.

Fuel oil accounted for nearly half the total demand for Pacific Coast territory, due mainly to growing war needs for naval and military operations in the Pacific. March demand for fuel oil of 442,-000 barrels was 17,000 barrels a day up over the previous month; and was greater by 71,000 barrels daily than for the first month of the present year.

Supply of all petroleum products in

March increased only 6000 barrels daily, necessitating withdrawal from storage of 35,000 barrels daily.

Total demand during the first quarter of 1943 increased 126,000 barrels daily over that for the like period of 1942. Of this increase, 98,000 barrels daily represents increased fuel oil demand. At the end of March, total stocks in Pacific Coast Territory were 10,257,000 barrels lower than a year previous. During the period March, 1942, to March, 1943, fuel-oil stocks decreased to 6,369,000 barrels and crude-oil stocks decreased to 5,433,000 barrels under the total of March, 1942. Gasoline stocks increased to 3,512,000 barrels over March, 1942, stocks.

Superior-Sunray Merger Discussed

Discussions which may result in merger of Superior Oil Corporation and Sunray Oil Company have been entered into by Elmo Thompson and C. H. Wright, respective presidents of the companies.

Preliminary to any concrete proposals is an analysis of any advantages that might ensue, and this has been suggested.

Sunray Oil Company's assets, as of the first of 1943 totaled $12,550,000 as compared with approximately $5,300,000 for Superior Oil Corporation. Both companies operate in Oklahoma, Kansas and Texas. Sunray Oil Company has a refinery near Allen, Oklahoma.

Drilling Increases in April; Wells Completed at Rate of 18,000 Yearly

Drilling activity has been increased materially, and the weekly rate of completing wells in the United States was 18 percent higher in April than in March, when development was at the lowest level of this year. The April completions averaged 345 per week, or on the basis of approximately 18,000 wells per year, compared with 21,412 completed in 1942, a decrease of 16 percent. In 1941, prior to restrictions brought by the war, the industry completed 32,210 wells.

The 345 completions per week in April compared with 292 weekly in March, 320 in February, and 346 in January.

Continuation of drilling in May on about the same basis as in April, or at a slightly increased rate, is forecast by the fact that there was some gain from April 1 to May 1 in the number of wells drilling or rigging up—an increase from 2267 to 2312. Wells actually drilling increased from 1952 to 2016.

Noteworthy increases in field work occurred in April in Pennsylvania, West Virginia, Kansas, North Louisiana, Michigan, New Mexico, Eastern Texas, and West Central Texas, where there were more completions in 4 weeks than in the preceding 5 weeks. Some other states and districts showed increases in weekly average completions, including Arkansas, Illinois, Ohio, Oklahoma, North Texas and West Texas.

States and districts that had more wells actually drilling on May 1 than on April 1 included Arkansas, California, Illinois, Indiana, Kansas, Kentucky, South Louisiana, Michigan, New Mexico, Oklahoma, Pennsylvania, West Virginia, Eastern Texas, and Southwest Texas.

Indian Lease Offer

Auction of oil lease on 75 tracts of Indian land in Osage County will be held at 1:30 p.m. Wednesday, May 26, at Pawhuska.

The tracts total 11,805 acres and with the exception of 9 are 160-acre sites. Eleven of the tracts listed are within the area of the extension of the East Watchorn pool.

April Well Completions Show Gain Over March and More Rigs Active May 1 Than April 1

(Figures compiled from weekly reports of editorial staff men, the following exceptions: Arkansas data from Arkansas Oil & Gas Commission; California from A.P.I. except for latest month; Illinois from Illinois Geological Survey except for latest month; Indiana from Indiana Division of Geology; Missouri from Missouri Geological Survey; Bradford and Kane-Clarendon, Pennsylvania, from The Producer's Monthly; Tennessee from Tennessee Division of Geology)

State or District	MONTHLY COMPLETIONS: April, 1943 — Details for April, 1943 — New Wells — *Oil	Gas	Dry	Others[6]	Old Wells Deepened	Total Completions — April, 1943[1]	Mar., 1943[3]	April, 1942[2]	Total Footage April, 1943	CUMULATIVE COMPLETIONS: First 4 Months — Details, Jan.-Apr., 1943 — New Wells — *Oil	Gas	Dry	Others[6]	Old Well Deepened	Total Completions — Jan.-April, 1943[5]	Jan.-April, 1942[4]	Percent Change	Total Footage 4 Months, 1943	RIGS IN OPERATION — Details for May 1, 1943 — Drilling	Rigs Up	Shut Down	Total: Drlg. RU and SD — May 1, 1943	Apr. 1 1943	May 1, 1942
Alabama								1								3									5
Arkansas	14	1	4	2		21	21	17	114,280	39	1	20	2	1	63	66	— 4.5	343,821	29	9	14	52	48	35
California	88	7	15		2	112	139	47	366,417	322	8	119		3	452	269	+ 68.0	1,464,104	206	53	31	290	265	189
Colorado	2		1			3		1	10,131	4		4			8	4	+100.0	28,229	2	1	12	15	15	22
Florida																			2			2	1	
Georgia								1								2					1	1	1	
Illinois	73	1	55	1	2	132	146	101	327,077	343	7	193	11	14	568	585	— 2.9	1,395,991	132	12	38	182	184	188
Indiana	4	2	10		1	17	26	31	26,864	32	4	46		4	86	130	— 33.8	149,858	31	2	17	50	44	59
Iowa																					2	2	2	1
Kansas	67	2	55	1	2	127	122	115	419,644	225	11	212	7	14	469	524	— 10.4	1,534,258	181	17	11	209	208	134
Kentucky	10	2	5			17	35	6	29,627	51	3	31		1	86	48	+ 79.1	163,001	41	6	7	54	50	21
Louisiana	19	1	15			35	42	65	267,449	95	8	63			166	346	— 51.9	1,205,519	111	11	27	149	136	168
North	5	1	9			15	13	26	88,735	30	5	32			67	152	— 55.9	316,396	37	7	20	64	60	68
South	14		6			20	29	39	178,714	65	3	31			99	194	— 48.9	889,123	74	4	7	85	76	100
Michigan	13	1	24		4	42	38	47	105,867	61	5	75		4	145	217	+ 33.1	377,868	72	12	25	109	131	99
Mississippi	1		1			2	2	9	8,848	2		6			8	52	— 84.6	45,590	6	5	6	17	14	12
Missouri							1	6		1		2			3	15	— 80.0	3,424	2			2	1	5
Montana	13	3	4			20	2	15	47,245	28	21	9			58	51	+ 13.7	116,728	18	12	13	43	41	55
Nebraska								7								16			1	1	1	2	2	23
New Mexico	11	2	9		1	23	19	28	68,282	46	2	29		6	83	133	— 37.5	230,320	45	2	18	65	62	116
New York	50		1	27		78	96	66	110,681	240	2	2	112		356	389	— 8.4	490,793	91	27	15	133	133	123
North Dakota																					1	1	1	
Ohio	8	34	25		1	68	77	49	181,026	43	145	89	1	4	282	375	— 24.8	730,660	142	20	35	197	205	172
Oklahoma	46	10	43	7	8	114	122	112	361,271	158	36	194	18	31	437	558	— 21.6	1,332,183	191	23	10	224	213	220
Oregon																								2
Pennsylvania	103	18	6	96		223	206	326	372,664	378	86	22	350	6	842	1,249	— 32.5	1,428,573	204	38	41	283	262	300
South Dakota																			2		1	3	3	1
Tennessee								1			1				1	4	— 75.0	1,358	3		2	5	4	4
Texas	160	7	108		12	287	318	409	1,155,206	607	50	473	15	37	1,182	2,326	— 49.1	4,853,056	450	34	91	575	620	668
E. T. Bor. Co.'s			1			1	3		7,304	5		1			6	2	+200.0	37,532	5		1	6	5	7
E. Tex. Field								2					2		2	13	— 84.6	4,280						1
Rest of E. Tex.	9		11			20	12	22	92,318	35	1	31			67	150	— 55.3	352,521	28	2	4	34	34	45
North Texas	31		31		1	63	78	55	171,359	107		145	12	10	274	379	— 27.7	728,987	83	2	18	103	111	88
West Central	7		24		1	32	20	18	72,216	23	7	67		5	102	136	— 25.0	224,191	35	1	8	44	53	58
West Texas	51		9		10	70	79	119	271,921	208	3	46		16	273	679	— 59.7	1,149,013	146	10	33	189	213	211
Panhandle	8	2				10	17	17	30,079	39	19	10		5	73	178	— 58.9	210,065	23	1	3	27	32	46
Upper Coast	12	1	3			16	24	33	135,012	44	2	30			76	187	— 59.3	576,363	41	11	9	61	51	59
Lower Coast	37	3	9			49	48	84	283,519	109	15	49	1	1	175	357	— 50.9	1,077,646	54	4	9	67	73	93
Southwest	5	1	13			19	31	51	74,059	34	3	71			108	196	— 44.8	420,250	28	2	3	33	35	36
South Central			7			7	6	8	17,419	3		23			26	49	— 46.9	72,208	7	1	3	11	13	24
Utah																			2		2	4	4	3
West Virginia	13	31	4		3	51	45	38	144,505	27	123	34		11	195	228	— 14.4	543,473	37	5	8	50	50	193
Wyoming	6		4			10	4	9	39,162	33	1	6			40	30	+ 33.3	160,404	15	7	15	37	32	41
Total U. S.	701	122	389	134	36	1,382	1,461	1,507	4,156,246	2,735	514	1,629	516	136	5,530	7,630	— 27.5	16,599,211	2,016	296	444	2,756	2,732	2,859

* Includes distillate wells. [1] Wells completed in 4 weeks, or 28 days, ended April 24, 1943. [2] Wells completed in 4 weeks, or 28 days, ended April 25, 1942. [3] Wells completed in 5 weeks, or 35 days, ended March 27, 1943. [4] Wells completed in 17 weeks, or 119 days, ended April 25, 1942. [5] Wells completed in 17 weeks, or 119 days, ended April 24, 1943. [6] Water input, gas injection, and salt water disposal wells.

International Developments

Canadian Company Drilling Gaspe Peninsula Deep Test

Drilling was proceeding at 26 feet in hard limestone on May 1 in the wildcat test, C. P. L. No. 1 of Continental Petroleums Limited on the Galt Brook dome on Gaspe Peninsula of Canada, south of the lower St. Lawrence River. Projected as an 8000-foot test, the well was spudded on April 30.

Plans call for a 20-inch hole to 42 feet for setting and cementing 16-inch o.d. surface casing, and for 15-inch hole from that point to 600 feet, for 13⅝-inch o.d. casing to be run from surface to the latter level.

The well is being drilled with cable tools and derrick 98 feet tall and 22 feet square at base.

While excavating for the foundations for the derrick and after getting down to bed rock and penetrating into the limestone, live petroleum was encountered.

This test is on an 85,000-acre property held by Continental Petroleums Limited, and the company also is proceeding with preparatory work for drilling C. P. L. No. 2 on the property, at a site 4 miles west of C. P. L. 1. The No. 2 well is to be a 2500-foot test, in the immediate vicinity of an old well called P.O.T. No. 20, which has been yielding high gravity oil for over 40 years. Work immediately ahead in connection with the No. 2 well includes building of roads, erection of camps, and hauling and installing machinery, to be supplied by the drilling contractor. Both tests have been contracted to Wilfrid Robert McMaster, who has drilled wells in both Canada and the United States.

Colombian Production Drop Reflects Tanker Shortage

Shortage of tankers for exporting Colombian oil caused a 57-percent drop in production of petroleum in that country during 1942. From 24,639,000 barrels in 1941, to 10,590,000 barrels in 1942, production dropped 14,049,000 barrels, with the decrease more pronounced as the year progressed. In December of 1942, output was only 188,000 barrels, compared with 2,221,000 in December, 1941. The December, 1942, production was on a basis of only about 2,250,000 barrels per year.

Canadians See Urgent Need For Depletion Allowance

The recent budget failed to deal with the important question of depletion allowances for oil-producing companies and is working a hardship on them and is not encouraging greater production of oil, R. H. B. Ker, president of Home Oil Company, Ltd., says in the annual report of the company released at Vancouver, B. C.

It is further stated in the report that in the opinion of the board of directors of the company, the production of oil in Canada is retarded by the fact that there is no person in the oil-control administration possessed of the necessary knowledge or experience to intelligently assist the producer of oil.

The report points out that the allowance for depletion still continues unaltered, although the oil industry in the United States has enjoyed a much higher rate than is allowed in Canada.

Ker says that oil producers in Canada, handicapped by high development costs and low price structure which would not justify the production of this oil in peacetimes, have during the war set a record, which is evidence that, granted conditions comparable to those in the United States, it would not be necessary for the government at this time to resort to the expenditure of public money in either subsidies or drilling.

Good Well Is Reported Completed at Ft. Norman

It is reported at Edmonton, Alberta, that a big new oil well has been drilled in the vicinity of Fort Norman, N.W.T., giving impetus to the widespread search for oil in the Northwest Territories.

There was no confirmation of the report, but it was learned a party of officials of United States contracting firms had visited the field.

It was also stated that oil drilling carried on in the Fort Norman field has resulted in the drilling of 42 wells, and most of these already were producing and had been capped when completed.

The drilling was done by Imperial Oil Company, Ltd., the paper said, and added the oil was believed to be of high grade, similar to that from the original wells in the Fort Norman field.

The search for oil in the north was expected to be extended over a wide field during the present year, it was reported.

It was known many prospecting parties had been organized and the whole country was being mapped.

Canadian geologists were reported cooperating with United States engineers in making a study of development prospects in the north.

Oil Field Discovery Is Reported in France

Reports from France state that a new oil-field discovery has been made in the Saint Gaudens area, where exploratory drilling has been under way for some time. However, no detailed information is available on the reported strike.

As a fuel for burning in gas generators for motor vehicles, attention has been directed recently to lignin, a residue in production of alcohol from wood.

Compagnie des Mines de Bruay has formed a subsidiary, Bruay-Progil, capitalized at 5,000,000 francs, for refining and distributing by-products of coal distillation.

A new organization, Comite' d' Organisation des Carburants de Reemplacement, has been formed in Paris to control manufacturers of charcoal and generator-fuel briquets, liquid substitutes, shale oil, and petroleum derivatives, although the latter now are insignificant in volumes available, therefore no longer requiring a special organization.

Oil Rights Obtained for Prospecting in Alberta

A more intensified search for oil in Southern Alberta this summer was predicted in official circles with the announcement by the Alberta Department of Lands and Mines that applications for petroleum and natural gas reservations covering nearly 100,000 acres in southern districts had been accepted during a recent week.

Northwest Company Limited was granted reservation rights for petroleum and natural gas on 79,805 acres in the region east of Taber and adjacent to the proven Taber oil field. The acreage, surrounding Grassy Lake, Purple Springs and Fincastle, is included in townships 9 and 10 of ranges 13, 14 and 15 west of the fourth meridian.

Major Oil Investments Limited was granted petroleum and natural gas reservations on 19,800 acres in the foothills region about 20 miles west of Parkland. This acreage is included in Townships 14 and 15 of Range 2 west of the fifth meridian.

Activity is gathering momentum with the warmer weather in various southern Alberta districts where drillers hope to strike oil. Meanwhile the two producing wells in the Taber field are continuing to make substantial shipments of crude to refineries in Lethbridge and Winnipeg.

British Oils Now Available to U. S. Navy

Under reciprocal lend-lease, petroleum stocks held by British commercial interests in many parts of the world will be available henceforth for fueling United States naval vessels, thereby providing the equivalent of advance bases and addition of many tankers to United States naval supply trains. Heretofore, only Britain's government-owned oil stocks have been so available. The supplies involved are in the United Kingdom, South Africa, India, the British colonies, Iran, Iraq, Palestine, Egypt, Eritrea, and Italian Somaliland, and the United States Navy will be especially benefited in the Arabian Sea, the South Pacific, and the Mediterranean Sea.

WPB Issues Urgent Call For Scrap Copper

Copper scrap is so urgently needed that it is classified as the Number One industrial salvage problem. Regional salvage managers of WPB have been asked to arrange meetings with members of Industrial Center Committees to formulate plans to increase the collection of copper, brass and bronze scrap by 62½ percent in 1943.

The government is depending upon scrap as the source for approximately 40 percent of its copper. A list of items that should be thoroughly examined for scrap purposes in the petroleum industry include: copper coils, feet and transmission lines, condenser tubes, pump bodies, cylinders, nozzles, foot valves, filters, floats, couplings, flanges, meter bodies, air separators, bearings and bushings.

Western Kentucky Leasing Boom Seen As Foreshadowing Drilling Campaign

A lease buying campaign, which may eventually involve more than 450,000 acres of land in western Kentucky, is under way with major companies, independent operators and lease brokers in a hot race for choice sites.

The campaign indicates that extensive exploration of the area, a part of the great interior coal basin, will be witnessed in the next few months.

The Carter Oil Company is the leader in the leasing effort and the entire campaign probably was started as a result of surface geology by that company, which has held a favorable view of the territory since 1938. Impetus was added to the campaign which was conducted quietly at first, by 1942 discoveries of good Cypress sand production in the area.

Involved in the play in addition to The Carter Oil Company are Shell Oil Company, Gulf Oil Corporation, Kingwood Oil Company, Sinclair Prairie Oil & Gas Company and others.

The hot areas are in a strip which extends along a straight line from Owensboro to Bowling Green, Kentucky, and includes all of Ohio and Butler counties, western Grayson County, western Edmonson County, northwestern Warren County, eastern part of Muhlenberg County and southeastern part of McLean and Daviess counties. Other leasing extends westward to Union County with small independents and lease brokers buying on the edges of the choice areas when better deals are not available.

The acreage has been running cheap, generally ranging from 10 to 25 cents per acre. Much of the choice land is under lease and buyers are combing the area again to clean up hold-outs and other sites.

In the early stages of the campaign, larger companies imported lease men from other states to place them in the field in order to secure all leases as quickly as possible, it was reported. One company had as high as 70 men in the field, it was said.

The same pay horizons are found in Kentucky as in Illinois. This fact coupled with the fact that the Kentucky coal region is part of the same interior basin region in which the Illinois coal region was found productive indicates that an active drilling campaign will be witnessed soon. The new area is on a direct trend with the producing areas of Kentucky, Indiana and Illinois.

Illinois Basin

Drilling Activity Takes Big Spurt Upward

Operations: Much warmer weather was credited with being responsible for an increase in drilling operations in Illinois. Forty-seven first reports were announced during the week, including 15 wildcats.

Jefferson County: Seaboard Oil Company's Eldridge Community 1, NE SE NE 3-4s-2e, more than a mile southwest of the King pool, pumped 104 barrels of oil and some water in 24 hours after a 60-quart shot in Rosiclare sand at 2902-07 feet. Before the shot the well was making but 1½ barrels an hour. Some observers regard the test as an extension of the King pool although that area so far is producing only from the Aux Vases sand and McClosky lime.

Hamilton County: Gussman and Phillips' Mead 1, SE SE NW 23-5s-6e, a wildcat 1½ miles northeast of the Hoodville pool, pumped 195 barrels of oil and a show of water in 24 hours, after 500 gallons of acid in McClosky lime at 3207-22 feet.

Clay County: Northern Ordnance Company's Sapp 1, SW SE 5-2n-5e, a wildcat near Xenia, was drilling below 4700 feet, following a drill-stem test at 4601-45 in which 760 feet of sulphur water was recovered in 60 minutes. A spotted show of oil was recovered in a Devonian core at 4610-20 but it appeared to have no commercial value. The test is the state's deepest current operation.

Franklin County: Ohio Oil Company's U. S. Coal and Coke 1, NE NE NW 13-6s-3e, was drilling at 3223 feet after finding a show of oil in the Lower O'Hara at 2895-2912 feet. On a drill-stem test of the saturated section, 47 feet of oil and 20 feet of oil-cut mud were recovered in one hour. St. Louis lime was topped at 3070 feet and it is probable that the wildcat will be plugged back to set pipe on the Lower O'Hara.

Kentucky

There were two prospective new pool-openers in western Kentucky.

Trans-Tex and Ashland Oil & Refining Company's C. T. Newman 1, C SW SE 13-O-19, Union County wildcat 2½ miles west of Morganfield and 4½ miles from nearest production, was testing Pennsylvania sand at 1428-40 feet, swabbing 8 barrels of fluid an hour, 92 percent of which is water. Hole was bottomed at 2755 feet and plugged back.

H. H. Weinert's George Greenwell 1, SW NE 11-O-20, two miles west of Waverly, abandoned at 2711 feet. Starting at surface elevation of 425 feet, Glen Dean was topped at 1996 feet.

Henderson County: Iley B. Browning's Strum 1, C S ½ NW NW NW 9-N-23, 1¼ mile northeast of Poole and 2 miles from nearest production, set casing on promising Tar Spring sand saturation at 1952-66 feet.

Webster County: Sinclair Prairie Oil Company's Cavanaugh 1, NW 12-N-23, wildcat near Poole, was drilling at 2141 feet, below dry Hardinsburg sand.

Sinclair Prairie Oil Company's Higginson 1, C E ½ SE NW SW 10-N-23, wildcat 2 miles east of Poole, plugged back and is preparing to acidize McClosky at 2660-90 feet. Hole was bottomed at 2747 feet.

S. Horan's T. T. Link 1, a mile north of Slaughters, is a new wildcat location for McClosky test.

Indiana

S. C. Yingling's Sophia Dickhaut 1, NW SE NE 19-6s-12w, Posey County, was cleaning and testing Cypress at 2340-56 feet, making about 3 barrels of oil an hour.

Oklahoma

New Pool in Prospect; Garvin Gas Well Still Wild

Deep Rock Oil Corporation's Harris 1, NE NW NE 11-10n-1w, Cleveland County, is preparing to test about 20 feet of saturation found in sandy dolomite encountered near 6500 feet. Seven-inch pipe was set to 6526 feet. A drill-stem test showed gas and a flow of oil which was shut in for lack of storage. The well is several miles removed from production.

Hughes County: Burke-Greis Oil Corporation and Deep Rock Oil Corporation's Turner 1, C SW NW 8-7n-10e, was coring Second Wilcox sand at 4732 feet in wildcat territory about 10 miles east of Holdenville, the well had showings from 4665 feet.

Coal County: In an area of sharp anticlines, Stanolind Oil & Gas Company and Amerada Petroleum Corporation's Cushing Royalty 1, NW NE SE 22-3n-9e, is drilling at 5938 feet in sand after recovering some stains of oil in a core at 5916-25 feet. Oil prospects are none too bright, but the well opened a new gas pool when it showed for 25,000,000 feet of gas daily from Cromwell sand.

Garvin County: Ohio Oil Company is drilling below 1000 feet at its relief well for Burns 1, SE NE SW 17-3n-2e, which has been out of control for more than a month, yielding an estimated 75,000,000 cubic feet of gas daily from Pennsylvanian sand at 2876 feet. Operators estimate another two weeks will be required to complete the relief well and shut in the Burns 1.

Kansas

Strike in Wallace County Holds Spotlight

A new field 66 miles from the nearest production is indicated by recovery of Lansing-Kansas City lime saturation at Broderick & Gordon, Inc., and Northern Ordnance's Grand Goodrich 1, C NE NE 9-14s-42w, Wallace County. An electric log test showed 31 feet of saturation in the lime at 4763-94 feet. Pipe will be set to 5663 feet, where the Arbuckle was found dry, and production test will be made through casing perforations.

Barber County: A new pool for western Barber County appears certain as a result of early tests at Champlin Refining Company's Allen 1, SE NW SE 22-32s-15w, which was found productive in Viola lime. When Viola lime pay,

"The Practical Geology of Oil"

By WILLIAM WOOD PORTER, II, S. B., A. M., Consulting Geologist

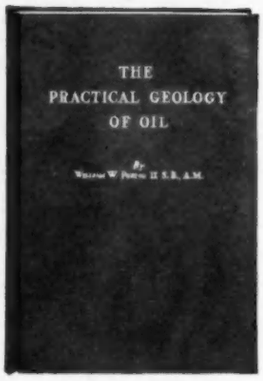

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TABLE OF CONTENTS

CHAPTERS:

1. Geological Problems.
2. Geological Names.
3. Introduction of Rocks.
4. Minerals.
5. Rocks.
6. Erosion.
7. Geological Time.
8. Fossils.
9. Sedimentation.
10. The Crust of the Earth.
11. Structural Geology—Folding and Faulting.
12. Concentration of Oil.
13. Unconformities.
14. How Wells Are Drilled.
15. Geology of the Hole.
16. Geological Exploration.
17. Geological Maps.
18. Sources of Geological Information.
19. What Price Oil Fields.

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encountered at 4995-5012 feet, was tested, the well flowed between 8 and 10 barrels of oil per hour through tubing. Given 1500 gallons of acid, the yield by flow into pits was estimated at 100 barrels per hour on the basis of a 40-minute flow. Strong gas pressure was noted. Well will receive additional tests when storage tanks have been moved in. Allen 1 is located nearly a mile west of Deerhead gas pool.

Aladdin Petroleum Company's National Gypsum Company 1, SW NW SE 20-30s-15w, no doubt will add another pool to the western Barber County area. Pay is in conglomerate sand at 4435-51 feet. Well flowed 82 barrels oil in 50 minutes and died. With well estimated as a 75-barrel producer, testing continues.

Pratt County: A north extension of the Iuka pool was in sight as Hollow Drilling Company swabbed Arbuckle dolomite at Harrell 1, SW NW NE 36-26s-13w. Dolomite was topped at 4325 feet and pay was found at 4327 feet. Oil rose in the hole when plug was drilled.

West Texas

Keystone Deep Well Makes Heavy Flow of Good Oil

The shallowest of two Ellenburger discoveries in Winkler County confirmed big flow prospects when Amon G. Carter's Walton-Pure 2-C, Keystone field's first deep test, flowed 265 barrels of 42.5-gravity oil with gas volume averaging 7,600,000 feet daily on 3-hour gauge through 1-inch outlet on 7-inch pipe set at 9550 feet. Production is from porous dolomite at 9550-9600 feet in Ellenburger, topped at 9217 feet with 307-foot section of prolific gas-distillate pay and possibly 26 feet of the oil zone excluded so as to try for balanced gas-oil ratio. This strike qualifies for a bonus allowable of 200 barrels daily for 18 months.

Walton-Pure 2-C developed a hazardous situation after making the preliminary test due to a break in the oil string permitting escape of oil between 7-inch and 9⅝-inch at 3642 feet. The well flowed 988 barrels of fluid between the two strings in four hours, and was making mostly oil when shutin. The big volume of oil and gas will charge the porous zones above the break until the well can be killed and the leak is eliminated. The situation is complicated due to clogged tubing, and attempt will be made to perforate tubing near bottom so as to permit circulation of mud for killing the flow.

Magnolia Petroleum Company's Walton-State 20, situated 3½ miles west and on a parallel structure, was awaiting production test through perforations at 10,752-10,772 feet with 4¾-inch on bottom at 10,774 feet. This prospect showed for greater oil flow when tested through drill pipe. Walton-State 20 entered Ellenburger at 10,460 feet, then logged 180-foot gas-distillate zone before entering oil zone at 10,640 feet, or 1137 feet low to the Keystone strike. Magnolia has started Walton-State 21, ¾-mile southeast.

Analysis of the crude produced by the Winkler County discoveries prior to running pipe reveals an attractive lube content and negligible volume of sulphur. Sample from Walton-State 20, testing 43.5-gravity, gave the oil an octane rating of 39 and .2 percent sulphur content. The laboratory recovery registered 29.4 percent gasoline, 375 degrees end point; 18.2 percent kerosene; 20.2 percent gas oil; 17.9 percent paraffin distillate; 13.9 percent residium; and .4 percent loss.

Development of the Keystone deep zone will proceed at a faster rate. Sid W. Richardson and Perry Bass will drill south and west offsets, while Gulf Oil Corporation is perfecting spacing arrangements for initial test on its 26,043-acre Keystone leasehold, extending to the south line of section bearing the discovery. Stanolind Oil & Gas Company will likely be an early participant, having acquired close-in acreage through purchaser of Wm. Little et al's Walton 80-acre lease, E½ NE PSL Section 2, with 3 Permian wells for $150,000 cash.

Stanolind-Shell Oil Company's Blue 1, east edge of Winkler County, was drilling 10,250 feet in sandy-lime. Top of Simpson corrected to 9510 feet.

Gaines County: Continental Oil Company's Jones 3, SE SW NE PSL 22, Block A-7 and offset to a 5156-foot Permian failure, will drill to 8000 feet in exploring Clear Fork. The company recently renewed its block in the area, which is in the northwest part of the county, paying a bonus of $75 per acre, half cash. Gulf Oil Corporation's Kottwitz 1, 7½ miles northeast of Seminole field, was drilling at 4650 feet. Markers have not been made public.

Pecos County: Magnolia Petroleum Company-Anderson-Prichard Oil Corporation's Powell-State 1, 1½ miles northeast of Apco pool, flowed sulphur water with trace of oil after drilling out cement to 3549 feet with 7-inch at 3539 feet. This wildcat made a prolific flow of oil and water when rotary returns were lost in a cavity at 3557 feet. Bryce McCandless et al's University 1, 7 miles south of Apco field, was awaiting orders in granite at 5505-13½ feet with granite wash below 4850 feet. Sandard Oil Company of Texas' Douglas 1, southwest edge of Yates field, was drilling lime 7460 feet without shows. Phillips Petroleum Company's Price 1 was drilling black shale at 10,670 feet.

Andrews County: Three wildcats were assigned this county the past week, and two will explore the Clear Fork. Skelly Oil Company's University 1-K, 2½ miles east by north of Emma pool, was drilling at 5930 feet, having passed probable production in Holt lime at 5464-5500 feet.

New Oil Pool Added In Jones County

Jones County gained a new oil pool on a northeast strike from the Wimberly pool when Fain-McGaha et al's Patterson 1, NW NW NE T&P 20, Block 17, filled 1100 feet with oil in 7 hours after drilling Tannehill sand at 2195-2003 feet with elevation of 1752 feet. Pipe was set on top of sand for completion. This wildcat is 2½ miles north by east of Wimberly multi-pay area, and on a unitized block of 720 acres.

Stephens County: Texas Pacific Coal & Oil Company's Hill 13, southwest offset to its prolific Mississippi oil discovery in Hill area, moving in spudder

to drill plugs from 5½-inch at 4244 feet with saturated lime at 4246-54 feet. It is 5 feet high on top of Mississippi. Rig will be skidded one location south by west.

North Texas

List of Prospective New Oil Fields Growing

Wildcats in Archer, Clay and Jack counties were added the past week to the growing list of prospective discoveries awaiting completion within the district. More than half dozen new pools are in the making, but majority will be pumpers.

Archer County: Phillips Petroleum Company's Wilson-Luke 1, NEc ATNCL 117, ¾-mile southwest of Canyon production in Chalk Hill field, recovered 50 feet of oil-cut mud when tester was used in Strawn at 4710-31 feet, with additional broken oil-saturated sand logged in drilling to 4755 feet. This wildcat will continue to Ellenburger objective. G. E. Kadane et al's Ferguson-Conoco 1, SP 1, midway between Holliday and Mankins, responded to treatment with 4000 gallons of acid through perforations at 4910-30 feet, detrital in Basal Pennsylvanian, and flowed into pits. No estimate was given on ability to produce.

Clay County: Continental Oil Company and W. B. Omohundro's Stephens 1, G. W. Stipps Survey and 7 miles west by south of Bellevue, yielded 125 feet of free oil and 250 feet of oil-cut mud when tester was used in saturation at 6013-37 feet in Mississippi, topped at 6010 feet. Pipe may be set to try for completion instead of fulfilling Ellenburger depth contract.

Leasing: Northeastern Wilbarger County experienced a brisk wildcat lease play that was paced by Magnolia Petroleum Company and The Texas Company. Interest arose through British-American Oil Producing Company's Wilkinson 1 showing possible production from Mississippi at 5871-5910 feet with free oil showing through drill-stem test from Basal Pennsylvanian at 5853-69 feet.

Jack County: Standard Oil Company of Texas and Hanlon & Buchanan's Carter 1, NEc Block 5, Wm. McDonald Survey, installing pump after swabbing 90 barrels of oil on 24-hour test. This discovery is producing from broken sand in Strawn at 3512-28 feet, having plugged back from barren Ellenburger at 5862-6040 feet to 3538 feet. Continental Oil Company's Weir 1, SEc of G. Kaltrider Survey, logged oil-saturated sand at 5081-87 feet, followed by shale to 5118 feet, where operations halted to run tester.

Cooke County: Four rigs are in service in the Walnut Bend field, which is yielding its most attractive wells from recently found Basal Strawn sand on the east flank of the structure. Sun Oil Company's Bacon 2 logged 80-foot section of sand in drilling to 5519 feet, and was showing for a big well on preliminary test. The company is starting Snuggs 1-B, south edge of the field, to explore flanking sands. Carter-Gragg Oil Company's Ramsey 1, northeast outpost, is on a 274-acre farmout from Ohio Oil Company. Sinclair Prairie Oil Company is nearing completion on the first tests for its two Harrison leases.

East Texas

Alba Prospect Soon Will Have Test to Trinity

The Alba prospect near the west edge of Wood County is a standout among the known structures receiving their first Trinity tests. Ability of this area to produce from Paluxy will be determined shortly by B. B. Orr et al's Rainwater 1, situated on an 8-acre lease and ½-mile north of the small town, as drilling was under way in Woodbine at 4510 feet. Top of Georgetown is due near the 5100-foot level. Iowa-Payne Oil Company, owner of small tracts in and near the town, has made tentative location for Howard 1.

Smith County: Wicklife et al's Hackett-Pure 1, sand flat prospect which showed for probable producer in Paluxy, was drilling at 8460 feet in upper Glen Rose.

Limestone County: Bert Weekley et al's Strother 1-A, north offset to the single oil well in the Barron pool, was awaiting official gauge after flowing 21 barrels of oil with considerable gas through small choke on overnight test. Pettit pay was acidized with 3000 gallons at 5684-5742 feet, total depth 5767 feet.

Discovery Pumper: Stanolind Oil & Gas Company's Tilson 1, Hunt County wildcat, 1¾ miles northwest of Campbell, will be equipped for pumping test, having swabbed 41 barrels of oil and 68 barrels of water in 14 hours after reperforating Paluxy saturation at 4358-66 feet. More development is slated for this faulted structure.

Quitman: Amerada Petroleum Corporation et al's White 1, southeast edge of field and structurally low, is due to make a marginal pumper. Original test through perforations at 6355-58 feet yielded show of 25-gravity oil with water, and later perforations at 6330-48 feet tested 13 barrels of oil without water on 11-hour swabbing. Additional perforations have been made at 6348-55 feet.

Wildcat Failures: In southwestern Franklin County, L. A. Grelling et al's Stanley 1, W. B. Jordan Survey, was eliminated through the recovery of water sand at 6155 feet in Paluxy topped at 6085 feet. Delta Drilling Company-Beckett & Torrans' Smith 1, Van Zandt County, 2½ miles northwest of Grand Saline, abandoned at 6583 feet in Paluxy, topped at 6466 feet.

Deep Projects: Humble Oil & Refining Company's Graham 1, Hunt County, Smackover lime prospect, was drilling Lower Glen Rose sandy-shale at 6120 feet, having logged massive anhydrite at 5541-5654 feet. In northeastern Kaufman County, Sun Oil Company's Rutledge 1, same objective, was drilling lime at 4040 feet in Georgetown, topped at 4021 feet.

JOHN W. GLAHN, landman for Cities Service Oil Company, has been transferred from Houston to Midland, where he becomes West Texas district landman, succeeding Robert Sutton, who resigned to join British American Oil Producing Company at Tulsa as division landman.

J. L. SLEEPER JR., West Texas scout for The Texas Company, Midland, has entered the U. S. Army's Fort Bliss training center.

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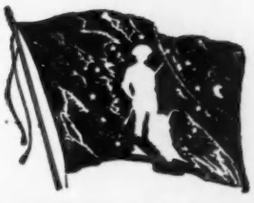

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Southwest Texas

Extension and Wildcat Drilling Still Active

The Lower Texas Coast and parts of Southwest Texas continue as active districts in the number of wildcat and flank drilling operations. Wildcat development also is in line for Willacy County with a large block of land being taken by The Texas Company. This particular area has been "cool" from a leasing angle, but several geophysical parties are working in the county and some acreage is being blocked. Potential tests have been run on two discoveries, one in Jackson and the other in San Patricio County—both completed as gas-distillate producers.

San Patricio County: John T. O'Neil has completed Welder Heirs 1, wildcat in Tares-Villareal survey, two miles southwest of old Angelita field, as a gas-distillate producer from perforations at 6840-46 feet. Although final gauge has not been run, the well showed 2575 pounds working pressure. A sand was logged around 6400 feet that indicated oil production. Total depth is 7123 feet with 5½-inch casing set to 6887 feet.

Kilgore Developers has been pulling pipe in Dix 1, wildcat six miles east of Mathis, after receiving gas and salt water in perforations in sand at 4170-85 feet. Total depth is 5653 feet with 5½-inch casing set to 4260 feet.

Starr County: Baldridge & King's Edgerton 1, wildcat discovery 8 miles northeast of Rio Grande City and 4 miles east of Los Olmos field, has been flowing 65 barrels per day through ¼-inch choke from perforations at 1222-26 feet although the flow has been erratic, tubing pressure 50 pounds, casing 350 pounds. Original perforations were made at 1222-25½ feet and the well flowed 150 barrels of fluid daily, mostly oil. Operators squeezed these holes and reperforated for a new test. This discovery, which may be placed on pump, is bottomed at 4510 feet and is located in southwest corner of share 66, porcion 80, J. A. de la Garza grant.

Jackson County: W. Stewart Boyle and Sterling Oil & Refining Company have completed gauge on Levy 1, wildcat discovery of Sterling field. Pipe perforated in Marginulina at 4844-50 feet after logging sand at 4836-50 feet. It flowed 13,500,000 cubic feet gas and spray of 26-gravity oil through 2-inch tubing. This discovery is on a 160-acre lease in the north end of Morris and Cummings survey 5.

Jim Wells County: Another oil field is indicated four miles northeast of Magnolia City with Humble Oil & Refining Company recovering 320 feet of oil and 10 feet of mud under 425 pounds flowing pressure in Evetts 1. Test was made at 5263-68 feet for 20 minutes, the oil being 38 gravity. This well already has shown for a gas-distillate field opener at 5021-35 feet. The discovery is five miles southeast of Alice.

Discovery: Continental Oil Company recovered 60 feet of distillate under 4000 pounds bottom-hole pressure in Wood 1, wildcat southwest of the old shallow Slick field on the DeWitt-Goliad County line in CEPI&M survey. The test was for nine minutes duration. Pettus was topped at 4316 feet but it showed water.

Texas Gulf Coast

San Jacinto County Test Planned to 12,000 Feet

Wildcatting continues to show signs of reviving with more locations projected in the coastal sector. Several new locations have been made on the edges of producing horizons in attempts to extend production or open new pay horizons. A Wilcox wildcat holding interest is a test five miles north of Cleveland in San Jacinto County. New operators have taken over the well and will drill it deep into the Wilcox.

San Jacinto County: Abercrombie Oil Company and Magnolia Petroleum Company have taken over Ohio Oil Company's Brewer 1, wildcat in H&TC 101, after the latter company drilled the hole to 10,007 feet in the Wilcox. The new owners plan to drill to 12,000 feet or deeper unless mechanical troubles develop. Ohio found one sand in Wilcox around 8626 feet that showed salt water.

Wildcats: Continental Oil Company has spotted location for an 8000-foot wildcat five miles northeast of Fairbanks, Harris County, and east of production at North Houston. The well is Mellinger 1 on a 160-acre tract in WCRR 17, Block 4, and is scheduled to test Cook Mountain, which produces at Satsuma.

The Texas Company has located Broussard 1, new wildcat three miles northeast of Hampshire in Jefferson County, an area that has been most active from a leasing and drilling standpoint this year. The well, which will be drilled to 8500 feet, is located on a 3179-acre lease in T&NO survey, abstract 206. The company has all offset acreage.

Chambers County: Two wildcats are being abandoned in this county, one that also is active in wildcat drilling. A. H. and C. L. Rowan have quit Quinn 1, Evan Douthit survey, at 9128 feet, no shows. Standard Oil Company of Texas and Salt Dome Oil Corporation are abandoning State-Trinity Bay 1, offshore in the bay near Ash Point, at 9120 feet.

Wharton County: Continental Oil Company is moving in to drill Peterson 1, wildcat five miles north of Louise. Location is on lot 3, block 1, Juan Villa Nueva survey. Well is scheduled to drill to 6000 feet.

Mackhank Petroleum Company has completed the first oil well at Boling in several months. The Farmer 16-C in James Scott survey, flowed 519 barrels per day through ¼-inch choke from open hole at 4830-4876 feet, with 540 pounds on tubing and 635 pounds on casing. The 5½-inch casing is set to 4830 feet.

South Louisiana

Bayou Couba Produces Oil; New Sand at University

Coastal developments last week was featured by the definite establishment of oil production in the Bayou Couba area of St. Charles Parish, a field that heretofore has been on the borderline of producing and a prospect. Another development is the opening of a new sand in the University field of East Baton Rouge Parish. Major interest is still centered on wildcats and semi-wildcats on the flanks of producing structures, although several wildcats are drilling that have indications of opening new fields.

St. Charles Parish: Gulf Refining Company has opened oil production in its third well on the Bayou Couba prospect with Delta Securities 3 flowing 262 barrels of pipe-line oil through perforations at 6450-70 feet through 5/32-inch choke, tubing pressure mounting to 1000 pounds. Hole was drilled to

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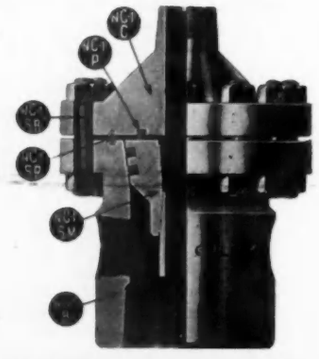

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6612 feet and 5½-inch casing set on bottom before the pipe was perforated with 120 shots. This well is an east offset to the discovery, drilled in 1942, but which later was reworked but without success. The second well was a dry hole. Location of the producer is in Section 13-15s-21e.

East Baton Rouge Parish: William Helis et al have opened a new play in University field with Nelson 14, Section 36-7s-1w, flowing 90 barrels of oil daily through 3/32-inch choke. Hole was drilled to 9960 feet with 7-inch pipe set on bottom and perforations made at 9590-96 feet. The tubing pressure mounted to 1650 pounds, and potential is now being run.

Evangeline Parish: Roy Lee, Trustee, is reperforating higher in Crowell-Spencer 1, semi-wildcat discovery of Wilcox production on west flank of Pine Prairie dome. The well originally was completed for 110 barrels of oil daily through ⅛-inch choke from perforations at 10,519-39 feet, however, the pressures dropped to a low level and operator is attempting to establish stronger flow slightly higher in the hole. This well is regarded as the most important flank sand development on the coast this year. Sands showing oil were found at 10,063-140 feet, 10,160-80, feet, 10,193-250 feet, 10,268-80 feet, 10,312-20 feet, 10,400-16 feet, 10,455-70 feet, 10,518-43 feet and 10,597-604 feet. The reserve already has three producing sands—the Cockfield and two in the Sparta section. The opening of the Wilcox is expected to result in several more Wilcox developments on the other flanks of the field.

Acadia Parish: Sun Oil Company is still testing Daily 1, wildcat in Egan area, Section 31-9s-1w. Casing was perforated at 10,610-25 feet with 50 shots, but mechanical trouble developed and no details have been announced.

Arkansas

Union County Well Has Gas from Unknown Sand

Sam Richardson et al's Graves 1, NE SE 17-17s-14w, Union County, showed 24,000,000 feet of dry gas from a zone which had not been determined. Pipe was set at 3100 feet and perforations for flow test made at 2927-28 feet. Pending outlet, it is closed in. The same operators' Moody 1, SW NW 16-17s-14w, which opened a new sand in Travis Peak at 3241-47 feet flowing 240 barrels of oil per day steady through choke and then died has been revived. Last flow test gauged 192 barrels of oil in 24 hours using 3/16-inch choke with casing pressure at 775 pounds.

Miller County: Magnolia Petroleum Company's Olivet A-9, NE NE 4-16s-26w, wildcat at Garland, plugged back from barren Smackover lime where it bottomed at 7905 feet. Casing is set at 5309 feet and Travis Peak horizon at 5141-5212 feet is to be tested.

Northern Ordnance's Adcock A-1, NW NW 1-19s-28w, six miles north of Rodessa field, topped Glen Rose at 5247 feet. Porous lime with slight show of distillate was recovered in section at 6598-6613 feet. Adcock A-1, which stopped drilling at 6706 feet was to plug back to 6677 feet but operators were detained with heaving shale at 3200-3800 feet.

Production at Fouke field was extended ½-mile northeast when Carter Oil Company completed Philyaw 1, SE SE SE 36-16s-27w, flowing 175 barrels of 33.5-gravity oil through perforations in Paluxy horizon at 3634-44 feet. The company moved rig to drill Strohacker Unit A-1, SE SW SW 31-16s-26w.

North Louisiana

Tensas Parish Discovery Awaiting Official Test

California Company and Carter Oil Company's Rhodes 2, NW 28-9n-10e, Wilcox discovery and the first producer for Tensas Parish in retest from perforations at 4435-42 feet showed 10 barrels of fluid an hour, five percent salt water, using ¼-inch choke. This test, which is two miles northwest of Lake St. John Wilcox production, was waiting on tanks and official test.

At Lake St. John, Concordia Parish, California Company's Community 1, SW 4-9n-10e was coring below 8905 feet.

Bossier Parish: Last operation for North Carterville, Hunt Oil Company's Brownlee 1, NE NW 10-23n-12w, set 7-inch pipe at 6198 feet, and flowed 133 barrels of oil on gas lift through open choke from Pettit lime perforations at 6061-88 feet, total depth 6202 feet.

An outpost to the south of North Carterville, White and Hinton's Louisiana 1, SW NE 16-23n-12w, was drilling below surface pipe set at 608 feet.

Winn Parish: Four miles east of Calvin Paluxy production, Mansfield Hardwood Lumber Company's Fee 1, wildcat topped Paluxy at 4890 feet, elevation at 200 feet, and was drilling at 6015 feet.

California

First Los Angeles City Deep Test Abandoned

The most publicized wildcat, Shell Oil Company's noise-proof, smell-proof, fire-proof try for deep production in the heart of Los Angeles, came to an inglorious end this week when abandonment was ordered after drilling into dips ranging to 90 degrees. This hole, Verne Community 1, 13-3-17, was bottomed in Middle Miocene at 7924 feet and, according to unofficial scout reports, at no level to that depth was anything of promise found. Announced as a "no dope" hole at the start, details of the drilling were not made public by the company.

Failure of this test was a great upset because in recent years, during which drilling inside city limits was prohibited, a most positive belief had grown up that deep zones surely would be found under old Los Angeles shallow fields if and when they could be drilled.

Lifting of the ban on city drilling was accomplished by Shell Oil Company only after protracted and difficult negotiations, a very considerable financial undertaking and the devising of an entirely new technique of drilling to overcome the city's objections to noise, smell, unsightliness, fire-hazard, etc. Once the permission was obtained, other companies rushed into the play with extensive community leasing programs that are still in progress. This leasing presaged an early start on a

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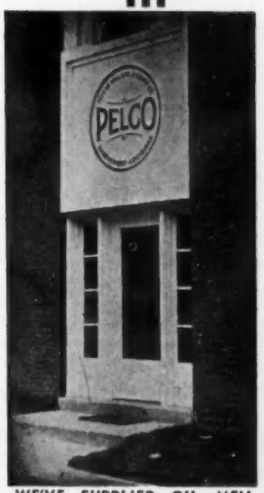

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rush of city drilling, but enthusiasm was dampened by this disappointing result.

Shell's unfavorable findings seem to have been conclusive only in so far as ground immediately adjacent to the wildcat is concerned because it is now reported the company will start a second test immediately, possibly whipstocking out from the site of the original test to another part of the surrounding acreage it holds.

Fresno County: Amerada Petroleum Corporation's Clemente 52-22, 22-17-19, Riverdale area wildcat, failed to find pay at objective depth around 6,900 feet, but it will not be abandoned there as decision has been made to carry it on down as a deep test. The same company's Helm Area wildcat Wheatville F 21-8, 8-17-18, intended to test deep possibilities of the southeasterly area, will be drilled to about 8,400 feet.

Kern County: Chanslor Canfield Midway Oil Company's wildcat 78-6, 6-32-23, after encouraging showings higher up the hole failed to find the Republic Pool equivalent expected around 3,000 feet, and abandoned at 3585 feet. However it was decided to start immediately on a second try and equipment is being moved to a new site 500 feet to the south and west.

Sheep Springs area came in for new attention this week when oil sand was picked up in Doheny-Battson-Los Nietos Company's Sheep Springs 1, wildcat in 20-29-21. Streaks of coarse-grained oil sand were found between 4515-4550 feet but on formation test of the interval recovery was salt water. Hole is being deepended with present bottom at 4881 feet.

Superior Oil Company announced a new wildcat, Lewis 3, SW NE NE 12-29-25, to test territory to the west of Greeley field, objective about 11,000 feet.

Kings County: Shell Oil Company's T.S.G. 28-21, 28-22-20, wildcat being drilled from a man-made island in Tulare Lake in the area of the same name, had passed originally plotted objective when last reported at 12,244 feet. The test, regarded as one of the most important wildcats now drilling in this state, likely will be drilled ahead until it becomes certain all possibilities have been tested.

Los Angeles County: R. W. Vandemeter & Associates have announced a new wildcat for the Puente area, the project to be located in Lot 2, Tract 3422.

Michigan

Clare County Wildcat Has Production Prospects

Sun Oil Company's Huber 1, S½ SW NW 6-19n-3w, Clare County, averaged 15 barrels day on swab from Dundee lime at 4084-4107 feet. After production test at 4137 feet drilling was resumed. Dundee top was logged at 4025 feet, elevation 1219 feet. It is 4½ miles northwest of an area that caused considerable excitement in 1940 when a test flowed up to 1200 barrels per day natural. Production dropped rapidly and the well finally was abandoned, and seven other deep tests, including three offsets, were dry.

Osceola County: Sun Oil Company's Wilcox 4, N½ NE SW 27-18n-8w, south flank of the Evart field, flowed up to 285 barrels per hour with 385 pounds casing pressure to set a field potential record. With north and west offsets producing, Sun would have to offset dry holes to drill either the east or south offsets to the well. Sun's Wickerham 3, N½ SW NE 28-18n-8w, however, completed in Dundee lime at 3720 feet for 301 barrels in 7 hours flowing natural to extend the field ¼ mile farther west.

Newaygo County: Still deepening at 3510 feet, Ohio Oil Company's core tested prospect in Norwich Township, Vaughan 1, S½ NE NE 29-15n-11w, logged Monroe at 3382 feet and had not developed any potential pays below the Traverse at 2815 feet. Dundee lime, topped at 3316 feet, carried a trace of water at 3327 feet.

Hearing: P. J. Hoffmaster, state supervisor of wells, has called a public hearing for May 19 to review producing conditions in various fields and in particular to study the necessity of bringing the new Aetna-Prosper field, Missaukee County, under state proration regulations. Meantime, Aetna-Prosper producers have agreed, Hoffmaster said, to voluntarily hold wells to a maximum of 262 barrels per day until official proration is reviewed.

The OIL WEEKLY'S TRADING POST

USED EQUIPMENT FORUM

CLASSIFIED ADS . . . EQUIPMENT . . . SERVICES . . . PERSONNEL

If you want to buy, sell or exchange good used equipment, a low-cost ad in these columns will get action for you in a hurry. See rates quoted below.

FOR SALE

■ **FOR SALE:** Rotary Drilling Outfit — Diesel Electric complete with drill pipe capable drilling 8500'. Atlas Imperial 200 HP Engines Allis Chalmers Generators and motors for both pump and hoist. Power equipment with or without motors saleable as a unit. Rig now stacked near Texarkana.

LUCEY PRODUCTS CORPORATION
Tulsa, Oklahoma

■ **FOR SALE:** Rotary Drilling Rig — Wilson Giant Drawworks, LeRoi 8-Cylinder Gas-Butane Engines, never run since rebuilt, choice 7¼" x 14" or 7¾" x 18" Lucey Pump, 122' Moore Derrick, outfit complete.

LUCEY PRODUCTS CORPORATION
Tulsa, Oklahoma

■ **FOR SALE:** 1100' of 10¾", 35.50 lb., new lapweld line pipe, T&C. Price $2.00 per foot at location, Austin, Texas. Reply Box 38, The Oil Weekly, Houston, Texas.

Second hand Oklahoma City alloyed sucker rods, ¾", ⅞" and 1".

Have sold millions of feet with good results; price about ½ of new.

Send your pumping problems to me.

M. R. TRAVIS
1702 S. Boulder — Tulsa, Oklahoma

POSITION WANTED

■ ACCOUNTANT with special Income Tax experience and Treasury Card with good knowledge of oil business (draft exempt) desires position preferably in large oil company. P. O. Box 6241, Houston, Texas.

OIL INDUSTRY PRINTED FORMS

■ **Immediately available all types of printed forms generally used by oil companies. Lease forms, daily production and gauge reports, priority, purchase and emergency order forms, labor time sheets, daily truck drivers reports, material and pipe tally forms, etc. Complete catalog on request. Address Oil Form Dept., Gulf Publishing Company, Houston, Texas.**

WANTED TO BUY

WANTED—Morpholine or Nitro-paraffin in any quantities. We are in dire need of Morpholine or Nitro-paraffin in our plant. If you have surplus stock and would like to sell, write or wire Minnesota Mining & Manufacturing Company, St. Paul, Minnesota.

CAPITAL WANTED

■ WANTED: Working capital. Have geophysical data indicating probable location of several Gulf Coast salt domes or structures. Additional torsion balance stations necessary to correlate data to prove or disprove existence. If you have the money to invest and would be interested in discovering new oil reserves on a participating basis, address: Christian Iden, Geophysicist, Box 1589, Willis, Texas, or 1740 Commerce Bldg., Houston, Texas.

SERVICES

■ TORSION BALANCE geophysical surveys contracted. Very reasonable rates. Modern instruments, experienced, capable, torsion balance field personnel. Expert interpretations. Address: Christian Iden, Geophysicist, Box 1589, Willis, Texas, or 1740 Commerce Bldg., Houston, Texas.

ADVERTISING RATES

TRADING POST SECTION

Regular classified advertisements for this special section, set in type this size without border, take flat rate of 7 cents per word for the first insertion and 5 cents per word for each subsequent insertion of same copy. Display advertisements for this section, set in suitably larger type with ruled border, are $5.00 per inch for first insertion and $4.00 per inch for subsequent insertions. Remittance must accompany copy which should be sent to:

Trading Post Section, THE OIL WEEKLY
P. O. Box 2608 — Houston, Texas

WAR MEMO:

The aims behind the War Bond Payroll Savings Plan are worth repeating over and over:

1. To help pay the stupendous production costs of winning this war.

2. To siphon into production channels that portion of America's *current income* which would otherwise flood the Nation with inflationary cash.

3. To create individual backlogs of financial security for use during the industrial readjustment after the war.

4. To create a Nation-wide saving habit which will serve the interests of both Capital and Labor after the war.

Keep after that "10% of gross payroll goal"! Buy War Bonds to the limit yourself—encourage your employees to do likewise!

United States Well Completions

CALIFORNIA

Fresno County—Coalinga Old Field: Shell's 107-29, nw sw sw 29-19-15, pump 33 bbls, perf 1790-1778, 1758-1657, 1607-1557, 1506-1467, 1442-1411, 1342-1312, 1282-1168 ft, black shale 1453 ft, Kreyenhagen 1802 ft, td 1808 ft.

Standard's 65-35A, sw ne ne 35-19-15, pump 68 bbls 20.8-gr, 7-in 3225 ft, completed 3099 ft, td 3230 ft.

Fresno County—Riverdale: Amerada's Larrey 8-14, sw sw sw 14-17-19, flow 342 bbls 35-gr, 430,000 gas, 12/64 in, 1225/1600 lbs, perf 6590-6610 ft, Temblor 5503 ft, td 6875 ft, pd 6625 ft.

Amerada's Zanolini 6-23, ne nw sw 23-17-19, flow 168 bbls 37.7-gr, 95,000 gas, 14/64 in, 290-650 lbs, perf 6810-6825 ft, Temblor 5567 ft, td 6900 ft.

Fresno County — Jacalitos: Standard's 61-35E, ne nw ne 35-21-15, pump 305 bbls 41.5-gr, 35 ft perf 4415 ft, completed 4374 ft, td 4415 ft.

Kern County—Cymric: Honolulu Oil Corp.'s 52, se nw ne 26-29-21, pump no est, 179 ft perf 1237 ft, sand 1060-1235 ft, td 1297 ft.

Kern County—Belridge South: Belridge Oil Co.'s 44-33, se se nw 33-28-21, pump no est, 722 ft perf 2985 ft, td 2985 ft.

Chanslor Canfield Midway Oil Co.'s B. F. 11-1, ne sw nw 11-29-21, pump 27 bbls 13.9-gr oil 7 water, 214 ft perf 1179 ft, oil sand 865 ft, td 1366 ft, pd 1180 ft.

General's Belridge 35-2, ne nw ne 2-29-21, pump 47 bbls 14.4-gr, 100 ft perf 1139 ft, td 1400 ft, pd 1139 ft.

General's Belridge 21-12, sw ne nw 12-29-21, pump 49 bbls 16.9-gr oil, 4 water, perf 1028-937, 919-862, 853-810 ft, td 1030 ft.

Shell's FKL 101-12, nw ne se 12-29-21, pump 120 bbls oil, 17 water, 66 ft perf 1018 ft, Tulare 948 ft, td 1098 ft.

Union's Hopkins 31-10, ne nw 10-29-21, pump 85 bbls 13.8-gr oil 21 bbls water, 31 ft perf 1708 ft, td 1710 ft.

Kern County—Buena Vista Hills: Standard's 101-15D, nw sw ne 15-32-24, pump 12 bbls, perf 2677-2645, 2610-2603 ft, td 2720 ft.

Kern County—Coles Levee: Richfield's KCL-A 16-32, sw nw sw 32-30-25, pump 150 bbls 36.5-gr oil, 50 water, perf 8651-8803, 8835-8923, 9043-9158 ft, "N" point 8285 ft, td 9161 ft.

Kern County—Kern Front: General's Young 7, se nw nw 14-28-27, pump 4 bbls 14.4-gr oil, 24 water, perfs 1880-1968, 2042-2127 ft, td 2128 ft.

Standard's 40, nw ne ne 15-28-27, pump 65 bbls oil, 11 water, 202 ft perf 2208 ft, td 2210 ft.

Kern County — Midway Sunset: Chanslor Canfield Midway Oil Co.'s 53-9, ne se sw 9-32-23, pump no est, perf 1705-1650, 1485-1465, 1450-1440, 1410-1405, 1280-1265, 1215-1205, 1195-1165 ft, td 1861 ft.

Standard's 42-15, sw ne ne 15-31-22, pump 36 bbls 13.7-gr oil, 4 water, 311 ft perf 1427 ft, oil zone 990 ft, td 1429 ft.

Kern County—Poso Creek Premier: Ohio's Midway Premier 16, nw sw ne 32-27-27, pump 7 bbls 13.5-gr oil, 30 water, perf 2567-2547, 2538-2508, 2498-2450 ft, td 2775 ft.

Ohio's Midway Premier 17, se nw se 32-27-27, pump 28 bbls 14.8-gr oil, 34 water, perf 2650-2610, 2550-2535, 2502-2487, 2470-2415 ft, td 2795 ft.

Standard's 5-22, ne sw se 5-28-27, pump 185 bbls 12.4-gr, 6⅝ in 2868 ft, completed 2678 ft, td 2870 ft.

Orange County—Huntington Beach: S. W. Exploration Co.'s State 54, 4244 ft wly along projection E. Ocean Ave fr c/l 23rd St., thence 322 ft nly at r/a, pump 245 bbls 20-gr, 480 ft perf 5280 ft, td 5280 ft.

Westport Oil Co.'s W. P. 9, 690 ft n, 825 ft e c/l Garfield and Huntington Beach Blvd, pump 75 bbls, 40 ft perf 3995 ft, td 3995 ft.

Sacramento County—Rio Vista: Amerada's S. & S. J. D. D. 3, 5600 sly along e/l Sacramento & San Joaquin Drainage District ppty fr nec thence 1850 ft wly at r/a, flow 8,000,000 dry gas, ½ in, 1240/1459 lbs, td 4363 ft.

San Joaquin County — Galt: Bankline Oil Co.'s Comm. 1-1, nw sw se 1-4-6, flow 8,050,000 gas, perf 2340-2327 ft, schist 5704 ft, td 5765 ft, pd 2383 ft.

Santa Barbara County—Cat Canyon: Union's Bell 16, 4390 ft s along e/l Bell ppty fr nec thence 330 ft wly at r/a, flow 838 bbls 18.3-gr oil, 235,000 gas, Miocene 4190 ft, td 5517 ft.

Santa Barbara County—Santa Maria Valley: Union's Bradley Lands 2-5, ne ne nw 36-10-34, pump 148 bbls 11.5-gr oil, 70 water, 421 ft perf 5083 ft, brown shale 4690 ft, td 5085 ft.

CALIFORNIA WILDCATS

Fresno County—Failure: Superior Oil Co.'s Cantua Land 54-36, 36-17-15, Cantua Creek area, abnd 10,729 ft.

Kern County — Failure: Chanslor Canfield Midway Oil Co.'s 78-6, 6-32-23, northwest Midway-Sunset area, non-commercial shallow zone saturation but barren in deeper objective, abnd 3585 ft.

Los Angeles County—Failure: Texas Co.'s McNalley A-3, 22-3-11, La Mirada area, shale and gray sand, abnd 9535 ft.

Sacramento County—Failure: Richfield's Natomas 1, 17-10-4, Sacramento area, abnd 5020 ft.

San Joaquin County — Failure: Amerada's Lodi Comm. 8-1, 8-4-7, abnd 3000 ft.

San Luis Obispo County—Failure: Western Gulf's Huasna Comm. 1, 35-21-14, Huasna area, abnd 3015 ft.

Ventura County—Failure: Standard's Seaboard-Calumet 2, 3-3-19, Shiells Canyon area, abnd 5138 ft.

ILLINOIS

Clay County: Texas Co.'s Risser 3, sw nw se 15-5n-5e, Aux V 2300-12 ft, 51 bbls, 2314 ft.

Kingwood Oil Co.'s Hall 2, se se ne 17-5n-7e, Weiler sd 2526-35 ft, 30 bbls, 2800 ft.

Clinton County: Robbin Oil Co.'s Vanderloo 1-B, sw nw ne 8-1n-3w, Weiler 1030-36 ft, 3 bbls, 1039 ft.

Texas Co.'s Defend-Grey 1, c se sw 35-3n-2-w, Dev 2656½-58 ft, 251 bbls, 2658 ft.

Effingham County: Kingwood Oil Co.'s Earnest 1, nw se ne 15-6n-5e, abnd 2593 ft.

Fayette County: Carter's Lancaster 4, nw ne nw 10-8n-3e, abnd 1539 ft.

Franklin County: Seaboard's U. S. Coal & Coke 10, abnd 3262 ft.

E. S. Adkins' Orient 16, nw sw ne 12-7s-2e, Tar Sprgs 2052-74 ft, 83 bbls, 2081 ft.

Gallatin County: Dickerson et al's Moye A-1, nw nw ne 15-8s-9e, abnd 2540 ft.

Skelly's Schmitt 3, ne sw nw 15-8s-9e, Cyp 2509-26 ft, 61 bbls, 2526 ft.

Carter et al's Busiek 6, c ne nw se 11-8s-10e, Clore 1727-32 ft, Tar Sprgs 2039-62 ft, 153 bbls, 2062 ft.

Hamilton County: Texas Co.'s Johnson 2, se sw sw 26-6s-6e, Aux V 3072-3103 ft and 3055-66 ft, 287 bbls, 3103 ft.

Texas Co.'s Russell 1, se sw nw 34-6s-6e, abnd 3300 ft.

Jefferson County: Magnolia's Peterson 1, sw ne se 26-2s-1e, Benoist 2018-27 ft, 10 bbls, 2030 ft.

Gulf's Ford 1, c sw ne 33-3s-3e, Aux V 2720-38 ft, 185 bbls, 2855 ft.

Texas Co.'s Willmore 1, c sw nw ne 33-3s-3e, abnd 2988 ft.

Lawrence County: Sam Malias C. Potts 3, c ne sw 26-2n-12w, Biehl 1372-98 ft, 25 bbls, 1400 ft.

Marion County: Big Chief Drlg. Co.'s Farthing 1, c sw se nw 15-1n-2e, Rosi 2097-2112 ft, 58 bbls, 2176 ft.

Kingwood's Dodson 2, c se se nw 16-1n-2e, Ben 1895-1912 ft, 41 bbls, 1916 ft.

Richland County: First Nat'l Bank & Trust Co.'s Shaw-Grey-Lahr 1, c n½ ne se 13-4n-11w, Bridgeport 755-91 ft, 4,805,000 gas, 791 ft.

Wabash County: Joe Bander's Foster 1, c nw sw ne 9-1n-13w, Ben 2511-21 ft, 25 bbls, 2523 ft.

Wayne County: Pure's Spicer Cons 2, sw sw sw 8-1s-6e, Aux V 3028-45 ft, 118 bbls, 3045 ft.

Gulf's Vogel 1-A, c sw sw 29-1s-7e, L. O'Hara 3179-90 ft, 146 bbls, 3253 ft.

Larry Romaine's Kinney 2, c ne sw ne 16-1s-8e, Aux V 3125-41 ft, 18 bbls, 3261 ft.

White County: McBride Inc.'s Hon 1-A, ne nw ne 6-4s-14w, Tar Sprgs 2331-36 ft, 81 bbls, 2928 ft.

Jarvis Bros. and Marcell's Cleveland 2-A, sw ne se 36-4s-10e, Penn 1346-48 ft, Clore 1983-89 ft, Palestine 2059-60 ft and 2093-94 ft, 55 bbls, 2338 ft.

Sun's Gardner 12, se sw nw 6-5s-11e, Tar Sprgs 2245-61 ft, 36 bbls, 3002 ft.

Magnolia's Gen'l Am. Life Ins. 2, se se sw 1-7s-8e, Walts 2184-92 ft, 66 bbls, 2192 ft.

ILLINOIS WELLS DEEPENED

Wabash County: Continental's Shultz A-5, se ne se 8-2s-13w, otd 2459 ft, Ben 2566-83 ft, 59 bbls, 2585 ft.

Wayne County: Sun's Mauck 4, c sw nw 20-1s-7e, otd 3231 ft, L. O'Hara, 3 bbls, 3283 ft.

ILLINOIS WILDCATS

Christian County—Failure: Central Illinois Oil Co.'s Zimmerman 1, c sw sw sw 36-11n-2w, abnd 1318 ft.

Cumberland County — Failure: Kingwood's Massie 1, c sw nw 12-9n-8e, abnd 2702 ft.

Fayette County—Failures: Cameron Bros.' Seibert 1, c se se nw 33-5n-3e, abnd 2040 ft.

Northern Ordnance's O'Connor 1, c nw ne 28-9n-1e, abnd 3140 ft.

Hamilton County — Failures: Texas Co.'s Rawls 1, ne ne se 1-4s-5e, abnd 3456 ft.

McBride, Inc.'s Marsch 1, se sw sw 32-6s-7e, abnd 3472 ft.

Moultrie County—Failure: Continental's Beachey 1, c ne nw nw 13-15n-6e, abnd 3681 ft.

Perry County—Failure: J. N. Harsh' Luchinski 1, sw se sw 23-4s-1w, abnd 1440 ft.

St. Clair County—Failure: N. W. Whitton

Wells Completed in the United States in Week Ended May 8, 1943

Data preliminary and subject to revision. Revised and more complete data on all completions shown in monthly summary of drilling, published in second issue of each month. More detailed data on wildcats published in third issue of each month.

State or District	FIELD COMPLETIONS: New Wells *Oil	Gas	†Input	Dry	Total	Old Wells Deepened	WILDCAT COMPLETIONS *Oil	Gas	Dry	Total	ALL COMPLETIONS This Week	Last Week	Cumulative This Year	Cumulative Last Year
Alabama	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Arkansas	....	....	....	....	....	....	....	....	....	....	....	7	62	78
California	23	4	....	....	27	....	....	....	7	7	34	30	490	293
Colorado	....	....	....	....	....	....	....	....	....	....	....	....	8	4
Georgia	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Illinois	21	1	....	6	28	2	....	....	12	12	42	33	683	674
Indiana	2	....	....	....	2	....	....	....	....	....	2	2	94	131
Kansas	16	1	1	6	24	....	2	....	10	12	36	36	541	548
Kentucky	1	....	....	....	1	....	....	....	....	....	1	8	95	50
Louisiana	3	....	....	1	4	....	....	....	....	1	5	26	197	383
North Louisiana	....	....	....	....	....	....	....	....	....	....	....	18	85	....
South Louisiana	3	....	....	1	4	....	1	....	....	1	5	8	112	....
Michigan	4	....	....	1	5	....	2	....	4	6	11	7	162	236
Mississippi	....	....	....	....	....	....	....	....	....	....	....	1	9	55
Missouri	....	....	....	....	....	....	....	....	....	....	....	....	3	15
Montana	....	....	....	....	....	....	....	....	....	....	....	....	58	58
Nebraska	....	....	....	....	....	....	....	....	....	....	....	....	....	18
New Mexico	4	1	....	....	5	....	....	....	....	....	5	2	90	144
New York	12	....	8	....	20	....	....	....	....	....	20	20	396	431
Ohio	2	7	....	5	14	....	....	....	....	....	14	9	305	416
Oklahoma	8	1	....	5	14	1	1	....	6	7	22	16	475	574
Pennsylvania	36	6	18	1	61	....	....	....	....	....	61	40	943	1,335
Tennessee	....	....	....	....	....	....	....	....	....	....	....	....	1	4
Texas	26	3	....	9	38	1	1	....	15	16	55	91	1,328	2,539
E.T.BorderCo.'s	....	....	....	....	....	....	....	....	....	....	....	1	7	....
East Texas Field	....	....	....	....	....	....	....	....	....	....	....	....	2	....
Rest of E. Texas	....	....	....	....	....	....	....	....	....	....	....	9	76	....
North Texas	2	....	....	3	5	1	....	....	4	4	10	19	303	....
West Central	1	....	....	....	1	....	....	....	3	3	4	8	114	....
West Texas	17	....	....	2	19	....	....	....	....	....	19	21	313	....
Panhandle	1	1	....	....	2	....	....	....	....	....	2	3	78	....
Upper Coast	1	1	....	1	3	....	1	....	1	2	5	7	88	....
Lower Coast	4	1	....	1	6	....	....	....	3	3	9	8	192	....
Southwest	....	....	....	1	1	....	....	....	4	4	5	15	128	....
South Central	....	....	....	1	1	....	....	....	....	....	1	....	27	....
West Virginia	....	5	....	3	8	....	....	....	....	....	8	7	210	257
Wyoming	....	....	....	....	....	....	....	....	....	....	....	....	40	30
Total U. S.	158	29	27	37	251	4	7	....	54	61	316	335	6,190	8,278

* Includes distillate wells. † Includes salt water disposal wells.

et al's Grossman 1, c nw nw ne 25-1s-9w, abnd 146 ft.

Wabash County—Failure: C. E. Skiles' Zimmerman 1, nw ne se 36-1n-13w, abnd 2582 ft.

Wayne County—Failure: Gulf's Beecher 1, c se se nw 7-1s-5e, abnd 3069 ft.

Williamson County—Failure: Superior's Moren 1, c sw sw se 11-9s-3e, abnd 2750 ft.

INDIANA

Gibson County: R. D. Brown, Inc.'s Fee 4, nw sw nw 36-1s-10w, Hardins 1406-19½ ft, 30 bbls, 1445 ft.

R. D. Brown, Inc.'s Fee 6, nw nw nw 36-1s-10w, Hardins 1394-1417 ft, 53 bbls, 1427 ft.

KANSAS

Barton County—Kraft-Prusa: Texas Co.'s Burmeister B-4, c se se 2-17s-11w, Arb 3403 ft, pot 2183 bbls, 3415 ft.

Black-Marshall's Hoffman 2, c sw sw 19-16s-11w, Gorham 3370 ft, pump 564 bbls, 3377 ft.

Black-Marshall's Hitchman 1, ne se sw 32-16s-11w, Arb 3323 ft, 4000 gals acid, 5,000,000 gas, 2702 bbls, 3338 ft.

Magnolia's Grossardt 2, c sw sw 9-17s-11w, Arb 3284 ft, 1000 gals acid, pot 1745 bbls, 3292 ft.

Barton County—Karber: Stanolind's Muesenberg B-2, c e½ sw se 1-19s-11w, Arb 3383 ft, abnd 3418 ft.

Butler County—Stern Area: J. J. Lynn's Vandenberg 2, sw sw ne 34-27s-6e, Simp dolo 3083 ft, pb 2135 ft, 3500 gals acid, swab 3 bbls oil, 8 wtr, 3129 ft.

Ellis County—Bemis: Earl Wakefield's Dreiling 1, c e ½ne ne 34-11s-17w, Arb 3454 ft, 500 gals acid, pump 137 bbls, 3484 ft.

Ellsworth County—Bloomer: Herndon et al's Ehley 1, c n½ se se 30-17s-10w, Arb 3242 ft, 500 gals acid, pump 195 bbls, 3252 ft.

Jefferson County—McLouth: Apperson & Stark's Bower-McLaughlin 1, se ne ne 5-10s-20e, Miss 1476 ft, pump 50 bbls, 1603 ft.

Graham County—Morel: Continental et al's Morel 3, nw se se 15-9s-21w, Arb 3920 ft, abnd 3943 ft.

Greenwood County—Virgil: Aikman & Bradden's Mennonite 2, c se nw 11-24s-12e, Miss 1725 ft, 1500 gals acid, pump 20 bbls, 1753 ft.

Leavenworth County — McLouth Area: Charles Miller's Moses Est 1, c se se 25-9s-20e, Miss 1300 ft, abnd 1492 ft.

McPherson County — Crowthers: Westgate-Greenland's Blessing 1, c ne se 27-17s-1w, Miss 2747 ft, pump 150 bbls, 2760 ft.

McPherson County—Lindsborg: M&L Oil Co.'s Gustafson 3, c w½ sw sw 7-17s-3w, Viola 3414 ft, 1000 gals acid, pump 761 bbls, 3421 ft.

Auto-Ordnance's Bengstrom B-1, c w½ sw nw 30-17s-3w, Viola 3366 ft, 4300 gals acid, pump 301 bbls, 3375 ft.

Phillips County—Ray: Cities Service's Griffin 2, sw se nw 27-5s-20w, Arb 3560 ft, perf, pump 313 bbls, 3685 ft.

Pratt County—Carmi: Shell's Stueder 1, sw nw se 29-26s-12w, Arb 4279 ft, pot 3000 bbls, 4317 ft.

Skelly's Miskiman 1, sw ne nw 32-26s-12w, Arb 4287 ft, 2750 gals acid, pot 3000 bbls, 4322½ ft.

Rice County—Chase: C. H. Weaver's Doll 2, c nw sw 20-19s-9w, Arb 3265 ft, abnd 3274 ft.

Russell County—Driscoll: Stanolind's Deines 1, ne se se 33-14s-14w, Arb 3226 ft, 3000 gals acid, swab 9 bbls oil, 49 wtr, abnd 3315 ft.

Russell County — Unnamed: Harry Gore's Kastrup 1, nw nw nw 15-15s-12w, Lans 2942 ft, 8000 gals acid, pump 203 bbls, 3027 ft.

Russell County—Forrest Hill: Skelly's Hilgenberg 1, c n½ sw nw, Arb 3348 ft, abnd 3365 ft.

Lauck & Moncrief and Sunray's Kluesner 1, c n½ nw sw 28-15s-12w, Arb 3294 ft, 1500 gals acid, pump 453 bbls, 3303 ft.

KANSAS WELLS DEEPENED

Rice County—Silica: Continental's Gunn 3, nw nw se 34-19s-10w, otd 3315 ft, Arb 3310 ft, salt wtr disposal well, 3310 ft.

KANSAS WILDCATS

Decatur County — Failure: Helmerich & Payne's Penn 1, nw nw sw 16-2s-19w, Lans 3752 ft, KC 3951 ft, Arb 4207 ft, abnd 4303 ft.

Kingman County—Failure: Rex & Morris' Werner 1, nec 4-29s-6e, Lans 1770 ft, KC 2155 ft, Arb 3263 ft, abnd 3271 ft.

McPherson County—Failure: Nadel & Gussman's Johnson Est. 1, c n½ nw ne 26-17s-2w, Lans 2220 ft, Miss 2828 ft, abnd 2845 ft.

Day's Campbell 1, c sw nw 9-19s-5w, Miss 3432 ft, Arb 3878 ft, abnd 3972 ft.

D. J. Marshall et al's Neel 1, ne ne nw 25-19s-5w, Lans 2750 ft, Viola 3893 ft, Simpson 3929 ft, abnd 3970 ft.

Pratt County — Failure: Cities Service's Whitman 1, nwc 11-27s-12w, Topeka 3175 ft, Viola 4366 ft, Arb 4562 ft, abnd 4640 ft.

Reno County—Failure: Fred Kosh and C. L. Carlock's Russell 1, sw se nw 33-22s-10w, Lans 3209 ft, Viola 3572 ft, Arb 3680 ft, abnd 3710 ft.

Adair & Morton's Long 1, ne ne nw 24-25s-8w, Lans 3177 ft, Simp 4139 ft, Arb 4231 ft, abnd 4208 ft.

Midstates Oil Co.'s Nies 1, nw nw sw 15-25s-10w, Topeka 2930 ft, Miss 3907 ft, Arb 4313 ft, abnd 4366 ft.

Rice County—Discovery: Mercury Drilling Co.'s Ploog 1, nw nw sw 5-18s-9w, Topeka 2511 ft, Lans 2888 ft, Arb 3229 ft, 1000 gals acid, 48.6-gr at 82°, pot 78 bbls, 3238 ft.

Sedgwick County—Failure: Dickey's Friess 1, nec 7-27s-2w, Miss 3595 ft, abnd 3655 ft.

Sheridan County—Discovery: Union Oil Co.'s Pratt 1, nw ne sw 23-8s-26w, Topeka 3535 ft, KC 3679 ft, Viola 4312 ft, Arb 4375 ft, perf 3803-17 ft, 41-gr, pump pot 689 bbls, 4444 ft.

KENTUCKY

Daviess County: Benedum & Trees' Calhoun 4, 22-P-27, Aux V 1727-43 ft, 50 bbls, 1751 ft.

SOUTH LOUISIANA

Evangeline Parish—Ville Platte: Continental's Evangeline Sec & Trust 3, start most se'ly cor sec 4, go nw alg nel 2869 ft, th sw at ra 379 ft in sec 4-4s-2e, set 6-in 10,251 ft, perf 10,152-70 ft, flow 262 bbls 16/64-in chk, td 10,251 ft.

Iberville Parish—Bayou Blue: Superior's Schwing 1, 330 ft n & 5016 ft w of se cor sec 68-9s-10e, abnd 8110 ft.

St. Charles Parish—Paradis: Texas Co.'s Armstrong 1, 1474 ft s & 1865 ft e ne c 8-14s-20e in 29-14s-20e, 7-in 10,450 ft, perf 10,268-320 ft, flow 227 bbls, 11/64-in, td 10,450 ft.

Terrebonne Parish—Gibson: Shell's Kuntz 7, n 53 mins w 1650 ft on wl sec 35 fr sw cor, thence n 89 deg 7 mins e 990 ft in 35-17s-15e, 5½-in 9540 ft, perf 9495-9502 ft, flow 260 bbls, 1/8-in, td 9512 ft.

SOUTH LOUISIANA WILDCATS

Acadia Parish—Discovery: Union Sulphur's Gueno 1, Branch area, go s 35 deg 45 mins e 3000 ft & 3 54 deg 15 mins w 660 ft fr ne cor sec 51-8s-2e, blew out 10,477 ft, sidetracked to 10,557 ft, perf 10,453-57 ft, flow 27 bbls dist, 14/64-in, td 10,557 ft.

MICHIGAN

Mecosta County—Fork: Smith Petroleum Co.'s Ralph 1, s½ sw sw 8-16n17w, Dundee lime pay 3818-24 ft, flow 210 bbls, 3825 ft.

Missaukee County—Aetna-Prosper: Gulf's Bunning 2, s½ nw nw 35-22n-6w, Dundee 3848-50 ft, pump 64 bbls, td 3851 ft.

Osceola County—Evart: Sun's Wickerham 3, n½ sw ne 28-18n-8w, Dundee 3715-20 ft, flow 301 bbls, td 3720 ft.

Sun's Wilcox 4, n½ ne sw 27-18n-8w, Dundee 3710-16 ft, flow 285, 1231 bbls 21 hours, choked, td 3716 ft.

Ottawa County—New Holland: Socony Vacuum's Mulder 1, c sw ne 36-5n-15w, Traverse 1465 ft, water 1468 ft, abnd 1469 ft.

MICHIGAN EXTENSION

Osceola County—Cedar: Ohio's Benzing 1, s½ se nw 34-18n-9w, 1 mile se field, Dundee 3802 ft, above 3816 ft.

MICHIGAN WILDCATS

Antrim County—Failure: Oil Producers' White 1, nw nw se 31-31n-5w, Dundee 1623 ft, abnd 1,770 ft.

Gladwin County—West Beaverton Discovery: Sun's State-A 1, e½ ne se 19-17n-2w, Elev 749 ft, Dundee 3841 ft, swab 19 bbls, 500 gal acid, td 3911½ ft.

Osceola County—Failure: C. L. Maguire's Bloemsma 1, s½ sw se 4-20n-8w, above 1897 ft.

Pure's Jones 1, n½ ne ne 24-19n-7w, Dundee 3939 ft, above 4075 ft.

Van Buren County—West Bangor Discovery: Roung & Clark's Allers 1, sw se sw 5-2s-16w, Traverse lime 1044 ft, acid 250 gallons, pump 6 to 10 bbls, td 1045 ft.

NEW MEXICO

Eddy County: Sudderth & Hicks' Wills 2, c se sw 14-20s-28e, 4,500,000 gas, natural, 793-887 ft.

Geo. Turner et al's Wills 4, c se nw 13-20s-28e, flow 75 bbls, 2-in, shot 30 qts 790-815 ft, td 825 ft.

A. S. Wooley et al's McIntrye 4-H, cse nw 3-17s-30e, flow 110 bbls, 2-in, shot 280 qts 2818-2985 ft.

R. R. Wooley et al's Arnold 4-B, c sw ne 27-17s-30e, flow 114 bbls, 2-in, shot 140 qts 3149-87 ft, td 3196 ft.

Lea County—Eunice: T. P. Coal & Oil Co.'s State 27-A, c se se 5-22s-36e, flow 624 bbls, 2-in, acid 2000 gals 3790-3872 ft.

OKLAHOMA

Creek County—Kellyville: Texas Co.'s Catlett 1, ne nw ne 35-17n-10e, Wx 2866 ft, abnd 2884 ft.

Creek County — Glenn: Sinclair Prairie's Berryhill 47, c e½ nw nw 16-17n-12e, Glenn 1400-1554 ft, shot 140 qts, pump 20 bbls, 1556 ft.

Sinclair Prairie's Berryhill 48, c e½ nw nw 16-17n-12e, Glenn 1387-1545 ft, shot 140 qts, pump 8 bbls oil, 3 wtr, 1545 ft.

Lincoln—Unnamed: Helmerich & Payne's Bonebrake 1, c nw nw 33-17n-5e, Brown lm 3610 ft, abnd 3625 ft.

Marshall County—Cumberland: Pure Oil's Thompson 206-2, se sw sw 21-5s-7e, McLish 5641 ft, flow 1920 bbls oil, 1,133,424 gas, 5740 ft.

Noble County—Otoe City: Superior's Marshall 1, c w½ nw sw 15-22n-1e, Avant 2979 ft, pump 15 bbls oil, 100 wtr, 3102 ft.

Okfuskee County—Rusk: Malernee's Robison 2, c se se 7-11n-8e, Cromwell 3684 ft, abnd 3699 ft.

Oklahoma County—Edmond: Harper & Turner's Brown 1, ne ne se 7-14n-2w, Bartles 5929 ft, pump 35 bbls, 5962 ft.

Osage County—Osage City: Clyroy's Osage 12, near c s½ s½ 36-22n-8e, sand 505-19 ft, pump 25 bbls, 519 ft.

Osage County — Flesher: M. J. Graham's Tribe 11, nw se se 1-22n-9e, sand 1465-72 ft, 170,000 gas, 1473 ft.

Osage County—W. Avant: Finance's Osage 55, c nw ne 31-23n-11e, Miss 1870 ft, abnd 2227 ft.

Pottawatomie County — Lake Shawnee: Stanolind and Amerada's Bleeker B-1, nw ne sw 28-10n-2e, dolo 5887 ft, abnd 5971 ft.

Pawnee County—Watchorn: Phillips' DeRain 3, sw ne nw 25-23n-3e, Bartles 3530 ft, pump 53 bbls oil, 55 wtr, 4029 ft.

Stephens County—W. Loco: H. J. Brown and Lance's Lowery 1, c sw sw 18-14n-9e, Prue 2339-85 ft, shot 80 qts, pump 15 bbls, 2388 ft.

OKLAHOMA WELLS DEEPENED

Oklahoma County—Oklahoma City: Skelly et al's Ainsworth 4, ne ne se 10-11n-3w, otd 6573 ft, sand 6585-97 ft, pump 125 bbls, 6615 ft.

OKLAHOMA WILDCATS

Cotton County—Failure: Stanolind's Mayer 1, ne nw 25-3s-12w, Cisco 1650 ft, T Canyon 2854 ft, Arb 3610 ft, abnd 3666 ft.

Creek County—Failure: Charlie Beal's Murray 1, nw nw nw 12-16n-7e, Prue 2565 ft, Bart 2897 ft, Miss 3370 ft, Misener 3696 ft, abnd 3702 ft.

Hughes County—Failure: W. A. Delaney Jr's Williams 1, c sw nw nw 22-6n-8e, Booch 2568 ft, Gilc 2800 ft, abnd 3125 ft.

Lincoln County—Failure: Big Chief's Calvin 1, sw sw ne 3-15n-5e, Layton 2315 ft, Prue 3360 ft, Wx 4367 ft, abnd 4418 ft.

Oklahoma County—Discovery: Ace Gutowsky et al's Wagner 1, nw nw sw 32-14n-4w, Deer Creek 3585 ft, Bart 6736-43 ft, Hunton 6877 ft, Simp 7380 ft, 1st Wx 7508-37 ft, 2nd Wx 7555 ft, perf 6945-57, flow 535 bbls, 2-in tubing, ¼-in, 7690 ft.

Osage County—Failure: Peters Petroleum Co.'s Osage 1, ne nw ne 11-22n-11e, temp abnd 1878 ft.

Pawnee County—Failure: Ingling & Parker's Eyler 1, c sw ne 23-23n-5e, Layton 1955 ft, Prue 2760 ft, Miss 3065 ft, abnd 3080 ft.

TEXAS GULF COAST

Galveston County—Alta Loma: Stanolind's Hulen 8, start n cor 642-ac lse, go 4490 ft sw alg nwl, th se at ra 949 ft, ctr 40-ac tr, abnd 9182 ft.

Jefferson County—Stowell: Glenn H. McCarthy's Crawford 1-A, 556 ft fr n&wl of ne sec 161, 5½-in 9045 ft, sand 8966 ft, perf 8966-84 ft, flow 202 bbls, 13/64-in, td 9055 ft.

Matagorda County—Citrus Grove: Continental's Anderson 1, 330 ft fr n&wl 130-ac tr, E. L. Holmes sur, 5½-in 4150 ft, perf 3980-90 ft, 50,000,000 gas, open, td 6555 ft.

TEXAS GULF COAST EXTENSION

Matagorda County—Old Ocean: Tide Water's McDonald 1, 1038 ft fr se & 1775 ft fr swl of 271-ac tr, Battle, Berry & Williams sur, 5½-in 10,880 ft, perf 10,075-89 ft, 10,094-99 ft, flow 454 bbls, 1/4-in td 10,904 ft, extends field 3200 ft west.

TEXAS GULF COAST WILDCAT

Harris County—Failure: Cities Service and Sun's Tucker 1, 1980 ft fr nl & 660 ft fr wl of sec 30, blk 2, abnd 7562 ft.

LOWER TEXAS COAST

Jackson County—Mayo: Salt Dome's Peters 1, 467 ft fr nw&swl's J. R. Sloan sur 14, 5½-in 5164 ft, perf 5108-17 ft, flow 27 bbls, 5/64-in, td 5450 ft.

Texas Co.'s Simicek 4, 1397 ft fr wl and 467 ft fr sl 165-ac lse, M. L. York sur 12, 5½-in 5376 ft, sand 5321 ft, perf 5321-34 ft, flow 105 bbls, ½-in, td 5460 ft.

Jackson County—Harmon: Walter Van Norman's McCrory 3, 467 ft fr nl and 1045 ft fr el of n 140-ac of 232-ac tr, M. L. York sur 12, temp abnd 5457 ft, may rework.

Nueces County—Stratton: E. B. Cox and J. L. Hamon's Noble 1, 467 ft fr s&wl's e½ e½ sec 199, Bishop Palo Alto subdvn, Paso Ancho de abajo gr, 5½-in 6595 ft, sand 6534 ft, perf 6534-36 ft, flow 114 bbls, ½-in, td 6685 ft.

Nueces County—Agua Dulce: Ginther, Warren & Ginther's Carver 1-A, 660 ft fr e, s and wl's 80-ac tr sec 86, Driscoll Rch, 5½-in 6998 ft, sand 6770 ft, perf 6770-83 ft, flow 13,000,000 gas, open flow, td 6998 ft.

San Patricio County—Odem: Seaboard Oil Co.'s Compton 3-A, 500 ft fr s and el's blk 13-A, 160-ac lse, Cubage & Miller subdvn, Juan Hart & Sons Gr, sand 5410 ft, 5½-in 5336 ft, perf 5416-24 ft, flow 127 bbls, ½-in, td 5536 ft.

LOWER TEXAS COAST EXTENSION

Jackson County—West Ganado: J. A. Gray's Cihal 1, 467 ft fr nwl and 467 ft fr n'ly swl of 176-ac lse, William Menefee sur, abnd 5424 ft, 2300 ft e prodn.

LOWER TEXAS COAST WILDCATS

Bee County—Failure: Bridwell Oil Co.'s St. John Unit 1, 330 ft fr se and swl's 32-ac tr, lot 32, Beeville townsite, J. Hefferman sur, abnd 4152 ft.

San Patricio County—Failure: Lonnie Glasscock's Dickerman 1, 660 ft fr n and wl's 200-ac lse sec 68, Paul's subdvn, San Patricio School Land sur 2, abnd 7297 ft.

SOUTHWEST TEXAS

Duval County—Strake: G. W. Strake's Yates Ranch 2, 330 ft fr nl and 990 ft fr el J. Poitevent sur 321, abnd 4028 ft.

SOUTHWEST TEXAS WILDCATS

Duval County—Failure: Quintana's Welder Heirs 1-B, 660 ft fr nel and 2640 ft fr nwl of 820-ac lse, M. G. Andross sur 24, 5 mi w Fitzsimmons field, abnd 4903 ft.

Jim Hogg County—Failure: Republic Natural Gas Co.'s Thompson 1, 466 ft fr wl and 880 ft fr sl blk 206, A. Fuller sur 577, abnd 3253 ft.

Starr County—Failure: Kirby Petroleum Co. and John Mayo's Elizondo 1, 660 ft fr s and el's BS&F 75, 3 mi nw Rincon field, abnd 6001 ft.

Webb County—Failure: W. T. Rigney and E. E. Farrier's Saldivar 1, 646 ft fr el and 673 ft fr sl blk 13, J. V. Borrego gr sur 1291, abnd 1108 ft.

SOUTH CENTRAL TEXAS

Guadalupe County—Failure: James H. Eddy's Peters 1, 660 ft fr nl and 1300 ft fr wl 100-ac lse Jesus Cantu sur, abnd 2766 ft.

NORTH TEXAS

Archer County: Cochran & Cain's Abercrombie-Taylor 1, 990 ft nsl and 2820 ft wel n⅛ SP, A-415, abnd 1950 ft.

Clay County: Sussex Oil Co.'s McInnis 4, Byers subdiv blk 59, pump 60 bbls, sand 1300-08 ft.

Wilder Dr Co.'s Taylor 4, 990 ft from nw and ne lines Bacon subdiv blk 41, abnd 1243 ft.

Montague County—Hildreth: Continental's Kaneaster 1, 553 ft snl and 554 ft ewl ET 56, Bend 6025 ft, flow 3292 bbls, 7/8-in, natural, 619/1 gas, conglomerate 6076-6118 ft, td 6118 ft.

Young County: Hassie Hunt et al's Shields 1, 719 ft nsl and 660 ft ewl TE&L 446, Miss 4743 ft, Ellen 4845 ft, abnd 5442 ft.

NORTH TEXAS WELL DEEPENED

Young County: Lion Oil Ref. Co.'s King-Wooten 1, 330 ft snl and 660 ft wel of E. Cornett sur A-73, otd 3768 ft, Marble Falls 4140 ft, Miss 4545 ft, abnd 4615 ft.

NORTH TEXAS WILDCATS

Archer County—Failure: L. T. Burns et al's Wilson-McCrory 1-A, 467 ft nsl and 1500 ft wel ATNCL 107, Bend 4847 ft, Ellenburger 5206 ft, abnd 5273 ft.

Cooke County—Failures: Akin-Dimock and Cochran & Cain's Ray 1, 990 ft from m/e/e and m/n/s lines of J. J. Coker-F. McCart sur, abnd 2507 ft.

W. T. Lucas and F. W. Lausen's Rosson 1, 330 ft nsl and 1522 ft ewl 380-ac tr, BBB&C 19, abnd 1707 ft.

Jack County—Failure: Peyton Gwynn & Overby-Hanlon & Buchanan's Kinder 1, 396 ft ewl and 1947 ft snl Earl Pearce sur A-467, abnd 5224 ft.

WEST CENTRAL TEXAS

Jones County—Wimberley: Butler-Horne Dr. Co.'s Fikes 3, 330 ft out sec blk 105, DeWitt CSL, flow 658 bbls, 15/64-in, natural, sand 2222-28 ft.

WEST CENTRAL TEXAS WILDCATS

Callahan County—Failure: Lane Oil Co.'s McDonald 1, 2063 ft snl and 1920 ft ewl Walter Converse sur 333, abnd 2007 ft.

Comanche County—Failure: P. S. Groginski et al's Falkner 1, 1000 ft snl and 330 ft wel E T 3, abnd 702 ft.

Palo Pinto County—Failure: H. R. Montgomery et al's Johnson 1, 2560 ft from sw and 330 ft from nw lines Bennett McNelly sur A-329, top Ellenburger 4857 ft, abnd in w 4862 ft.

TEXAS PANHANDLE

Gray County: Texas Co.'s Love 1, 1326 ft snl and 1328 ft wel H&GN 27, blk 25, elev 2740 ft, granite 2405 ft, 3,417,000 gas, 265 lbs rp, natural, granite-wash 2308-29 ft, td 2459 ft, pb to 2342 ft.

Hutchinson County: Panhandle et al's Herring 5-B, Walters sur, pump 612 bbls, acid 3000 gals 3212-28 ft.

WEST TEXAS

Andrews County—Mascho: Cities Service's University 1-E, c ne se sec 10, blk 10, pump 44 bls, shot 205 qts 4520-80 ft.

Cities Service's University 1-F, c nw ne sec 23, blk 10, pump 57 bbls, 19 water, shot 280 qts 4495-4590 ft.

Cochran County—Slaughter: Continental's Deal 13-58, 651 ft nsl and 6025 ft ewl leag 58, Martin CSL, flow 1391 bbls cas, acid 12,000 gals 4952-5004 ft.

Jerry Hawkins et al's Mallet 44-A, 580 ft out sec lab 15, leag 47, Edwards CSL, flow 552 bbls, cas, acid 11,500 gals 4895-4943 ft.

Skelly's Mallet 1, 440 ft out NEc lab 10, leag 53, Scurry CSL, flow 246 bbls, ¾-in, acid 8000 gals 5006-45 ft.

Crockett County—World-Powell: Peck & Hall's Powell-Shell 1, 1320 ft nsl and 2419 ft ewl GC&SF 63, blk BB, pump 142 bbls, acid 1000 gals 2644-49 ft.

Hockley County—Slaughter: Falcon Co.'s Grant 4, 440 ft snl and 665 ft wel lab 12, leag 42, Rains CSL, flow 533 bbls, ¾-in, acid 8000 gals 4900-35 ft.

Pecos County—Abell: Anderson-Prichard's Gregg 1-B, 2094 ft from ne and 668 ft from se lines H&GN 101, blk 10, flow 1949 bbls, ¾-in, natural, Ellenburger perf 4625-4730 ft, td 4744 ft.

Magnolia's Fromme 2, 660 ft from nw and sw lines n¼ H&GN 106, blk 10, Ellenburger 4430 ft, flow 1028 bbls, ½-in, acid 2000 gals, perf 4660-4715 and 4545-4645 ft, td 4731 ft.

Pecos County—Lehn: Burk Royalty Co.'s Sullivan 13-C, 330 ft from nw and 843 ft from ne lines H&GN 72, blk 10, flow 120 bbls 2-in, shot 60 qts 1699-1720 ft, td 1730 ft.

Pecos County—Taylor-Link: Milton Unger et al's University-Shell 4-A, c se ne sec 32, blk 16, flow 872 bbls, 2-in, acid 1000 gals 1382-87 ft.

Pecos County—White-Baker: Cardinal Oil Co.'s White-Baker 7-B, 1010 ft nsl and 990 ft ewl TC 36, blk Z, jkd 582 ft.

Reagan County—Barnhart: Sharples Corp.'s University-Humble 2, c se sw sec 3, blk 48, Ellen 8984 ft, flow 1854 bbls, 16/64-in, acid 1500 gals 9048-9152 ft.

Upton County—McCamey: Trebol Oil Co.'s

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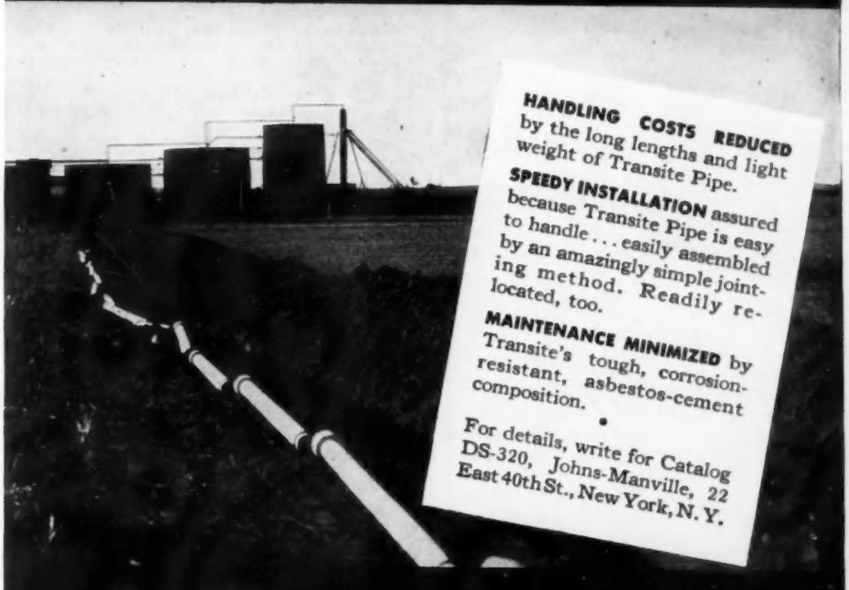

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UNITED STATES WELL COMPLETIONS

Ricker-Humble 4-C, 654 ft from nw 1326 ft from ne lines sec 6, blk R. E. C. Grooms sur, pump 139 bbls, acid 2000 gals 2681-96 ft.

Ward County—Pecos Valley: T. E. Jamison and Chas. Pollard's White 4, 660 ft from se and sw lines H&TC 36, blk 1, elev 2423 ft, top flow sul w 2950 ft, abnd 3110 ft.

Winkler County—Keystone: Tide Water Associated's F'Pool 4, c sw ne PSL 22, blk B-3, flow 130 bbls ½-in, shot 366 qts 3147-3330 ft.

Yoakum County—Wasson: Belfort Oil Co.'s Herd-Humble 4, c sw ne sec 795, pump 306 bbls oil, 20 wtr, acid 3000 gals and shot 280 qts 5062-5145 ft.

Drilling & Exploration's Knight-Shell 4-A, c sw nw sec 773 flow, 72 bbls, 5/16-in, acid 10,000 gals 5000-5220 ft.

Plymouth Oil Co.'s Bennett 2-C, 760 ft snl and 560 ft ewl sec 630, flow 215 bbls, 5/8-in, acid 9000 gals 5216-90 ft.

United States Wildcat Starts

CALIFORNIA

Kings County: Tide Water Associated's Orchard 1, McClure Valley area, 30-24-18, lcn.

Los Angeles County: Standard's Frew 1-1, 29-3-16, Aliso Canyon area, lcn.

Standard's Newhall L. & F. 3-1, 19-4-17, Del Valle area, lcn.

Sacramento County: Peter Cook Jr.'s 4, 17-4-3, Rio Vista area, lcn.

Richfield's Natomas 2, 28-10-4, Sacramento area, lcn.

ILLINOIS

Clay County: Joe V. Dunbar's Huber 1, sw se nw 17-5n-5e, lcn.

Eason & Oberling's J. A. Walker 1, se se ne 25-5n-6e, lcn.

Franklin County: Kingwood Oil Co. et al's Valier Coal Co. 1, ne ne se 17-6s-2e, dr.

Gallatin County: Robinson & Puckett's Smith 1, n½ ne se 29-8s-9e, lcn.

Jefferson County: Nash Redwine's Gilbert 1, ne se nw 25-4s-2e, lcn.

Deep Rock's Ivan H. Cox 1, se nw ne 36-4s-3e, lcn.

Lawrence County: DeKalb Agriculture Assn.'s King 1, se ne se 8-2n-12w, lcn.

B. M. Heath et al's Boyd 1, nw nw nw 24-2n-12w, lcn.

Richland County: J. E. Bauer et al's Warner 1, nw se ne 24-3n-11w, lcn.

KANSAS

Barber County: Olsen Oil Co.'s Swartz 1, c sw ne 6-32s-11w, dr.

Barton County: Ohio's 1-A Kraft nec sw 26-16s-11w, lcn.

Sanolind's Nairn 1, swc 35-19s-15w, c&p.

Branine & Goering's Purcell 1, nwc se 20-20s-13w, mirt.

Crowley County: J. J. Lynn's Newfield 1, c w½ nw ne 11-34s-4e, dr.

Ness County: Magnolia's Olson 1, se sw se 33-17s-25w, lcn.

Pawnee County: Vickers' Ashworth 1, c n½ ne nw 17-22s-15w, br.

Rice County: Three Way Drilling Co.'s Musenberg 1, nec nw 17-19s-10w, dr.

Scott County: Stanolind's Turin 1, nwc 16-19s-31w, lcn.

KENTUCKY

Henderson County: Sinclair Prairie's Bradley 1, 8-N-23, lcn.

Ashland Rfg. Co.'s Gallaway Hrs 1, 9-N-23, dr.

Creekmore & Rooney's Priest 1, 16-P-26, lcn.

MICHIGAN

Allegan County: C. J. Smith's Lane 1, c ne sw 14-1n-14w, lcn.

Midland County: Rex Oil & Gas Co.'s Sprenger 1, se se ne 3-15n-sw, rig.

SOUTH LOUISIANA

Calcasieu Parish: George M. Frankos' LeBleu 1, 660 ft s&e of nw cor sw nw 28-9s-7w, w Iowa field, lcn Marg-Frio test.

OKLAHOMA

Caddo County: Texas Co.'s Mah-set-ky 1, nw ne nw 33-5n-11w, lcn.

Carter County: Northern Ordnance's George Fish 1, nw nw ne 10-1s-2w, mim.

Coal County: Mid-Continent and Delaney's Bowlby 1, nw se se 14-3n-9e, mit.

McIntosh County: Pine et al's Dodd 1, se se se 26-11n-15e, dr.

Noble County: Ohio et al's Zimmerman 1, ne se nw 19-23n-2w, rur.

Okfuskee County: Northern Ordnance's Blumenthal 1, c ne sw 7-13n-7e, rur.

Payne County: Osborne et al's Mansur 1, nw sw se 26-18n-6e, dr.

WEST CENTRAL TEXAS

Callahan County: E. M. Thomasson et al's Montgomery 1, 1800 ft wel and 3550 ft snl of J. H. Pickens sur 221, lcn 800-ft test.

Comanche County: O. L. Johnson et al's Eanes 1, 3000 ft ewl and 330 ft nsl John Marshall sur, lcn 1000-ft test.

Hamilton County: Geo. B. McCamey et al's Blom 1, 705 ft nsl and 2201 ft wel of R. D. Ramsey sur, lcn 3500-ft test.

Shackelford County: W. K. Woods et al's W. H. Green 1, ne ne sw T&P 49, blk 12, lcn 1200-ft test.

TEXAS GULF COAST

Jasper County—Houston and American Republics' Fee 1, 3267 ft fr nl & 467 ft fr wl of Salvador Castillo sur, lcn.

Chambers County—John Mayo, Kirby Petroleum Co and Wynn Crosby's Jackson 1, 660 ft fr s&el J. S. Roberts sur, lcn.

LOWER TEXAS COAST

Bee County: Rodney Delange and W. Earl Rowe's Driscoll 1, 330 ft fr n&wl blk 36, Thomas Banuelos sur, 2½ mi e Skidmore, 5500-ft Vicksburg test.

Jackson County: Salt Dome's Mauritz 1, 330 ft fr nl & 5997 ft fr el 600-ac lse, Jessie White sur, lcn.

Karnes County: F. M. Frasher's Mischer 1, 330 ft fr nel and midway between nw&sel of 280-ac lse John Miller sur, lcn.

Nueces County: Sam E. Wilson's Podest 1, 467 ft fr n&wl of n½ nw sec 32, Agua Dulce area, Los Sauces gr, lcn.

San Patricio County: Coastal Refineries' Johnson 1, 660 ft fr n&wl of ne sec 35, George H. Paul subdvn, J. J. Welder Rch, J. Bowen sur, 6250-ft test.

Victoria County: H. I. Crow, C. L. Tucker and Leslie Johnson's Skarda 1, North McFaddin area, 330 ft fr sel & 330 ft e of perpendicular line fr s cor lse, lot 30, Francisco Perez sur, lcn 7000-ft test.

Continental's Crain 1, North McFaddin area, 1650 ft fr n&el of 2080-ac tr J. Varin sur, lnc.

SOUTHWEST TEXAS

Duval County: Quintana Welder 2-B, 660 ft fr nel & 660 fr sl 820-ac B lse, Seale & Morris sur 229, lcn 6000-ft test.

Duval County: Transwestern Oil Co.'s Duval County Ranch 32, 330 ft fr s&el of sur 302, 2 mi n Casa Blanca field, lcn.

Live Oak County: R. P. Holland's Tullis 1, 330 ft fr n&el 20-ac lse blk 75, S. B. Turner sur 19, 1 mi se White Creek field, lcn.

SOUTH CENTRAL TEXAS

Travis County: Marts & Beaven's Pearson 1, 330 ft fr ne&sel 100-ac lse Thomas Westbrook sur, 1 mi n Elroy, lcn.

NORTH TEXAS

Archer County: Frank Buttram et al's O'Donohoe 1, c ne ne ATNCL 104, lcn 6500-ft test.

Consolidated Oil Co.'s Humphrey 2-C, 1330 ft out SWc E. Heath sur, lcn 1650-ft test.

W. T. Hutcheson Jr. et al's Dycus 1, 1486 ft snl and 330 ft wel blk 144, Harris subdiv, 3½ mi ne Archer City, lcn 1450-ft test.

Avis B. Taylor et al's DeMoss 1, 1350 ft

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For the American Victory

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ewl and 1500 ft snl sec 2, C. A. Smith sur, lcn 1300-ft test.

White & Duncan's Abercrombie 1, 1320 ft snl and 990 ft ewl sec 94, blk 4, Clark-Plumb sur, lcn 1300-ft test.

Jack County: C. H. Peterson et al's D. R. Sewell 1, 450 ft out SWc sec 3, J. B. Irvine sur, lcn 400-ft test.

Wichita County: Cable Oil Co.'s Willis 1-D, 330 ft snl and 1650 ft ewl of 250-ac tract, W. H. Anderson sur A-1, lcn 1400-ft test.

Gorman & Metzner's Parker 2, 630 ft snl and 750 ft ewl of e-60-ac s½ sec 22, Palo Pinto CSL sur, lcn 1400-ft test.

Gorman & Metzner's W. C. Parker 1, 1000 ft snl and 1400 ft wel sec 23, Palo Pinto CSL sur, lcn 1400-ft test.

Wilbarger County: Tom F. Hunter et al's Throckmorton 1, 660 ft out SWc sec 149, Waggoner Colony subdiv, lcn 6000-ft test.

WEST TEXAS

Andrews County: Belfort Oil Co.'s White-Texaco 1, c ne sw PSL 8, blk A-44, lcn 5000-ft test.

Humble's Crews & Mast 1, c sw se PSL 8, blk A-34, lcn 8500-ft test.

Union Oil Co.'s Biles 1, c nw ne PSL 19, blk A-31, lcn 7400-ft test.

Squeaks from the Bull Wheel

A Tribute

"What do you think of a man who constantly deceives his wife?"

"I think he's a wonder."

Not What He Expected

"Hey, Moe, when you have your tonsils removed, they call it a tonsillectomy; when you have your appendix removed, they call it an appendectomy; what do they call it when you have a growth removed from your head?"

"Don't know, Joe. Tell me."

"A haircut."

Day Had Come

"What? You don't mean to say you are going shopping in all this rain?"

"Of course I am. I've saved up $5 for a rainy day, and this is the first opportunity I've had to spend it."

Succinct Response

A private was ordered to clean an officer's inner sanctum. Quickly he went to work. He wiped the desk, cleaned the chair, dusted the books. A half hour later the officer walked in. Everything was tip-top—except the floor.

"Private," remarked the officer, "wasn't the floor washed?"

"No."

"No WHAT?"

"No mop."

Technical

Assessor: And this goat will cost you another four dollars.

Taxpayer: Four dollars! Why?

Assessor: The law in this town says that "all property abutting on the street shall be taxed two dollars per front foot."

Particular

Diner: Two eggs, please. Don't fry them a minute after the white is cooked. Don't turn them over. Not too much fat. Just one pinch of salt and no pepper. Well, what are you waiting for?

Waiter: The hen's name is Mary . . . Is that all right, sir?

Very Dull

Girl—I suppose you find it rather dull in the evening.

Airman—Simply nothing to do, at all. We play darts, do the cross-word puzzle, drop a few bombs on Hamburg, and go straight to bed.

Prodigies

One of our Washington acquaintances reports that an Army public relations officer recently had a call from a girl in the Office of War Information. She wanted a list of all Army officers nineteen years of age or less.

"You mean all ranks?" the Army man asked.

She considered this for a spell, and then said brightly, "No, just up to major generals."

Such As?

What are sins of omission?
Those we have omitted to commit.

Habit

The eccentric man walked into a restaurant and sat at a table.

"What will you have, sir?" said the waiter.

"Not a thing," replied the customer. "I'm not hungry."

The waiter stared.

"Then what's the idea of coming in here?"

The customer shrugged his shoulders nonchalantly.

"It's very simple," he explained. "This is my lunch hour."

Retort Courteous

"Broken arm?"

"Yes."

"What with?"

"Trying to pat myself on the back."

"What on earth for?"

"Minding my own business."

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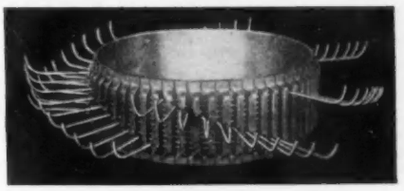

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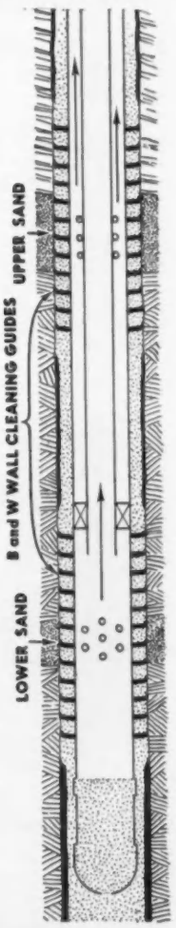
The advantages of dual completions, including the large savings of steel, increased production, etc., indicate an increase in this type of completion during the present emergency.

The first requirement in a successful dual completion is a good cement job. A good cement job is one where the set cement entirely fills the annulus and is in bond with the formation to maintain oil, gas and water in their original position and to prevent the migration of any fluid behind the casing.

B and W Wall Cleaning Guides, placed as shown in the diagram throughout the sections to be produced, scratch off the mud cake, center the casing, and insure the proper placement of the cement slurry in bond with the formation.



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Notes for the Equipment Buyer and User

Generator

HUNTER-HARTMAN CORPORATION

Hunter - Hartman Corporation, St. Louis, Missouri, announces a new portable gasoline-driven generator. The equipment is designed to charge 6-, 12-, and 24-volt batteries at 10 to 300 amperes. It consists of a specially designed generator driven by a 6-horsepower, single-cylinder, air-cooled, gasoline engine which is equipped with air cleaner, gasoline filter, magneto, self-starter, rope starter and remote stop control.

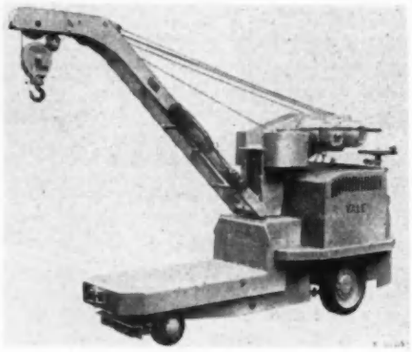
Applications of the unit include starting motors, charging batteries, generating current quickly wherever it is needed, or generating current for lighting with output from 1000 to 3000 watts.

New Handling Tool

YALE & TOWNE MANUFACTURING COMPANY

Yale & Towne Manufacturing Company, Philadelphia Division, Philadelphia, Pennsylvania, announces a new twin-unit crane, a two-in-one materials handling tool. This unit, Model K23E-6C2T, 6000-pound capacity low elevating platform truck is combined with a 2000-pound capacity twin-unit crane.

The outfit is electrically powered with four speeds forward and reverse, and combines all the latest engineering advancements such as compactness, small over-all dimensions for maximum maneuverability in close quarters, and maximum visibility and safety for the operator.



Model K23E-6C2T

A Yale Cable King Winch unit supplies the hoisting and booming power and both can be operated simultaneously through separate push button type crane and hoist controls. Separate, independent motors and power units drive the truck for travel as well as hoist and boom load.

It is said that the twin unit crane combines the features of hoisting, booming and slewing to the truck's operations, greatly increasing its usefulness. Loads can be picked up, placed on the low elevating platform of the truck, into bins, on skids, or spotted where desired.

The Army-Navy E production award has been made to Ladish Drop Forge Company, Cudahy, Wisconsin. The address of welcome was made by Victor F. Braun, president of the company. Lieutenant Colonel Edward H. Bowman, of the Air Corps made the presentation on behalf of the Army, and Herman W. Ladish, chairman of the board, accepted. A token presentation of E pins was made by Captain D. D. Dupre, Commandant of the Naval Officers Training Corps, at Marquette University, to Otto Retzloff who accepted on behalf of the 3400 workers. In the picture, left to right, are Bowman, Ladish, Retzloff and Dupre.

New SKF Building Saves Large Quantities of Steel

Use of substitutes for steel in the construction of its new Gwynedd, Pennsylvania, plant of SKF Industries, Incorporated, has resulted in savings of enough of this vital material to build 68 medium tanks or one large destroyer, according to announcement.

The main manufacturing building, containing more than 7 acres of production space under one roof, is completely blacked out. Its principal construction detail, which resulted in the saving of 1750 tons of steel, features the use of 1450 wood trusses, each with a 40-foot span and supported by reinforced concrete columns. The use of cement asbestos for underground piping and terra cotta for rainwater conductors conserved 95 tons of ferrous metal. Cement asbestos ventilating ducts released 32 tons of sheet metal for more vital work. Various other substitutions of wood were responsible for savings of 23 additional tons of steel.

Tubular Goods

Republic Steel Corporation, Cleveland, Ohio, announces publication of a new Republic Electric Weld Oil Country Tubular Goods Price List No. 20. This list conforms to the API simplified list for casing and tubing No. 5-A. In addition to prices, the list incorporates essential data on dimensions, depth properties and mill test pressures.

"Collapse and Joint Strength Data," of Republic Electric Weld Casing, Normalized, is another new bulletin. Information in this bulletin conforms to API simplified list No. 5-A, and is the result of more than two years of research by the Technical Committee of API.

Sprockets

Link-Belt Company, 307 N. Michigan Avenue, Chicago, has published a new illustrated book No. 2067, listing the sizes of cast-tooth sprocket wheels that are available quickly from stocks carried by Link-Belt plants and warehouses, and distributors. Tabulations are included on the sizes of wheels that have been most commonly ordered over a period of years.

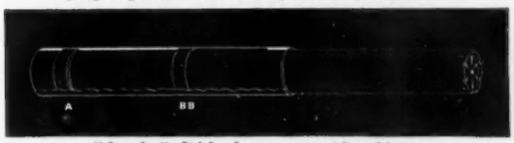
Wire Rope Conservation

John A. Roebling's Sons Company, Trenton, New Jersey, has published three instructive pamphlets on wire rope conservation: How to Inspect Drums Used with Wire Rope; How to Inspect Sheaves Used with Wire Rope; and How to Inspect Wire Rope. These pamphlets, illustrated by descriptive diagrams, were written by A. J. Morgan, chief engineer.

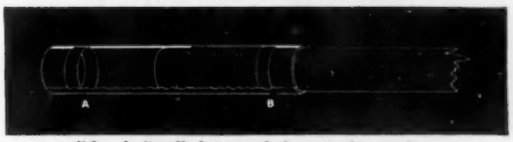
Conservation tags are also distributed by Roebling, and tag "B" is designed especially for the oil industry. It gives simple and helpful hints on the care of wire rope to the man on the job. The tag is made up in a convenient size and is printed in two colors, and is varnished to insure long life on the piece of equipment to which it is attached.

NEW DU PONT "FAST-COUPLER"

Cut-away view of "Fast-Coupler" showing gripping rings that hold cartridges securely in place.



"Coupler" slid back over cartridge. Movable gripping ring gives compact assembly.



"Coupler" pulled out ready for second cartridge to be inserted at left end to make up charge.

Two-cartridge load. "Fast-Coupler" gripping rings securely hold both cartridges in place.

WITH manpower a serious problem in the field, crew chiefs will welcome this quicker, surer way of making up charges of gelatin dynamite.

The new Du Pont "Fast-Coupler" makes it possible for one man to join cartridges securely together in a quick and easy manner. It requires only a fraction of the time of older devices. New crew members quickly learn to use it.

Equal in importance to speed is the firmer grip on cartridges you get with the "Fast-Coupler." Charges remain intact under the most adverse lowering and poling conditions and the possibility of losing all or a part of a charge is reduced to the minimum.

It will pay dividends in time and better results to look into this new method of preparing seismic charges.

NEW BOOKLET shows "Fast-Coupler" in field use. For your copy, just tear out this ad, write name and address in margin and mail to: *Du Pont, 2508 Nemours Bldg., Wilmington, Del.*

DU PONT
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"FAST-COUPLER"

IT WORKS FAST . . . IT HOLDS FAST

ATTACK and DEFEAT

Boiler Scale and Corrosion!

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Automatically

Removes and Prevents

Regardless of Water or Operating Conditions, and Saves Shut-Downs and Water Analyses.

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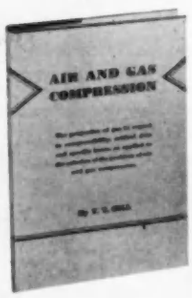

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Men in the Industry's News

DR. C. H. MATHEWSON, president of the American Institute of Mining and Metallurgical Engineers and chairman of the Department of Metallurgy at Yale University, will be the guest and speaker of the Gulf Coast section of the Institute in Houston on May 11. The meeting will be held in the Houston Club commencing at 6 p. m., with dinner at 7 o'clock. Members of the American Society of Metals and others interested, have been invited to attend.

J. L. MATHIEU, vice president of Schlumberger Well Surveying Corporation, talked on "The Self Potential Dipmeter" before the Houston Geological Society May 6.

PAUL ENDICOTT was elcted vice president and assistant to the president at the annual meeting of Phillips Petroleum Company, and W. G. Hiatt was named vice president of the refining division.

HY BIRD, vice president and secretary of the Phillips Petroleum Company, has resigned to become vice president and treasurer of Panhandle Eastern Pipe Line Company.

CAPTAIN EARL C. PERRY, former scout for Sinclair Prairie Oil Company, a bomber pilot who was wounded in action in North Africa, has been returned to a hospital at West Palm Beach, Florida.

W. J. WILSON, until recently manager of the land office for F. D. Parriott, Tulsa, has returned to Ohio Oil Company's staff and is employed in the wage, hour and personnel division at Findlay, Ohio.

JOHN W. HADDOCK has been elected president of Farrel-Birmingham Company, Ansonia, Connecticut, and Buffalo, New York. He was formerly vice president of Sullivan Machinery Company, is a member of AIME, Army Ordnance Association, and is active in affairs of the Compressed Air Institute and the American Mining Congress.

WARD C. BEAN, Shell Oil Company, spoke on "The Geology of the Roumanian Oil Fields," before a meeting of the North Texas Geological Society, at Wichita Falls, Texas, April 26. At the next meeting on May 26, Dr. Paul D. Krynine, professor of geology, Pennsylvania State College, State College Pennsylvania, will deliver an address on "Diastrophism and the Evolution of Sedimentary Rocks."

CHARLES A. BUTCHER, formerly assistant to the national manager of the company's district manufacturing and repair department, has been named manager of that department for the entire Pacific Coast District of Westinghouse Electric & Manufacturing Company. He succeeds R. E. Powers, resigned.

C. P. WATSON, Seaboard Oil Company, has been elected president of Producers Agency of California. L. A. Cranson, Honolulu Oil Corporation; William C. Whaley, Barnsdall Oil Company; H. E. Woodworth, Safe Oil Company; Robert H. Garrison, I. W. Hellman Estate; and R. M. Blodget, Blackfoot Petroleum Company, are vice presidents. Secretary-treasurer and assistant secretary-treasurer are W. A. Russell, Seaboard Oil Company, and Verne Harrel, Bankline Oil Company. R. W. Sherman, British-American Oil Producing Company, Richard A. Grant, Fullerton Oil Company, and O. D. Knight were elected directors.

K. S. ADAMS, president of Phillips Petroleum Company, has accepted an appointment as chairman of the Oklahoma post-war planning commission and as vice-chairman of the state planning and resources board. The appointment was made by Gov. R. S. Kerr after it was declined by Frank Phillips.

JAMES GALEY died, April 25, at his home in Beaver, Pennsylvania. He was 85 years old and was the last survivor of eight brothers, long active in Pennsylvania oil activities. He was known as the Grand Old Man of Beaver Valley, and was one of the few men who lived before the advent of the Drake Well, and who operated in the first oil field of this country.

MICHAEL PATRICK HANLEN, 93-year-old retired oil man, who was acclaimed "grand old man" of the 1939 International Petroleum Exposition in Tulsa, died May 1 in a Tulsa hospital after a long illness. A native of Butler, Pennsylvania he entered the oil business when a young man and moved to Oklahoma 35 years ago. For the past 12 years he had resided in Tulsa.

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*Ajax Iron Works 25
*American Sand-Banum Co. 80
*American Steel & Wire Co. 31
Axelson Manufacturing Co. 17
*B and W, Inc. 77
*Baker Oil Tools, Inc. 1
Wm. M. Barret, Inc. 77
*Bethlehem Steel Co. 42
*Cameron Iron Works, Inc. 41
The Carter Oil Co. 39
*Caterpillar Tractor Co. 29
Columbia Steel Co. 31
The Continental Supply Co. 23
*The Dehydro Co. 35
*E. I. du Pont de Nemours & Co. 79
The Eagle-Picher Lead Co. 30
*Elastic Stop Nut Corp. 2
Ft. Worth Laboratories 77
*Gardner-Denver Co. 4
*General Electric Co. 5
*Gray Tool Co. 53
*The Guiberson Corp. 34
*Gulf Coast Machine & Supply Co. 70
Gulf Engineering Co. 40
*Halliburton Oil Well Cementing Co. ..... IV Cover
Houston Laboratories 77
*Hughes Tool Co. ..... I Cover
*Johns-Manville Corp. 75
Earle M. Jorgensen Co. 49
*Lucey Boiler & Manufacturing Corp. 65
*Mission Manufacturing Co. 27
*Morse Chain Co. 50
Moser Manufacturing Co. 38
Murphy Diesel Co. 37
The National Supply Co. 18-19
*Oil City Brass Works 76
*The Parkersburg Rig & Reel Co. ..... II Cover
*Patterson-Ballagh Corp. 40
*Pelican Well Tool & Supply Co. 71
*Quaker Rubber Corp. 76
Reading-Pratt & Cady Division American Chain & Cable Co. 20
*Reed Roller Bit Co. 3
*Rollway Bearing Co. 55
R. H. Sheppard Co. 66
*Thornhill-Craver Co. 40
*Union Wire Rope Corp. 32
*Unit Rig & Equipment Co. ..... III Cover
United States Steel Corp. 31
*Worthington Pump and Machinery Corp. 8
The Youngstown Sheet & Tube Co. 6